Crisis Recovery and Monetary Policy

The evolution of monetary policies from the Great Depression to Covid-19

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1. Introduction

Financial crises have always been inherent in our economic systems. In many cases they are unexpected, while in others they could have been prevented. Their impact affects all of us in our everyday lives; lower available income, inflation, uncertainty, and unemployment are only a few of the byproducts. To state that the role of the monetary authorities is crucial is an understatement. Central banks design their monetary policy strategies to minimize the negative impact of the financial crisis at all layers of the economy. This is no easy task.

During the last 20 years, the world has experienced two of the most profound Financial Crises; the Great Recession (the economic downturn from 2007 to 2009 after the bursting of the U.S. housing bubble) and the global financial crisis that followed) and the COVID-19 Pandemic, with deep adverse effects on a global level, affecting many countries. Central Banks had a crucial role and needed to rethink their 'traditional' Monetary Policies and react quickly with unconventional measures and expansionary policies.

It was a surprise. Economists believed they had finally unlocked the secrets of the economy. We had learnt all that was important to learn about macroeconomics. The Great Recession signaled the end of the Great Moderation (mid-1980 until 2007*), a period of decreased macroeconomic volatility*. The Great Moderation had proved to be, at least in part, a Great Illusion. A same feeling that probably led Fukuyama (2002) to declare "the end of history".

Once the crisis struck, central banks rose to the challenge. They pulled out all the stops to avoid a repeat of the Great Depression. And they succeeded. They had to invent and apply Unconventional Monetary Policies (UMPs) to address the issues of varying complexity in a highly interconnected financial world.

This thesis aims at documenting and comparing Monetary Policy measures that have been employed by Central Banks in several different crises that occurred in single countries (Country-wide crises) and crises that have a multicounty impact (Global Crises), while also assessing the efficiency of each monetary policy chosen.

The financial crises analyzed and assessed are as follows:

Country-wide Crises

- The crisis in Sweden (1990-1994)
- The crisis in Mexico (1994)
- The crisis in Turkey (2000)

Global Crises

- The Great Depression (1929)
- The Great Recession (2007-2009)
- The COVID-19 pandemic crisis (2020-)

Methodology

The analysis and methodology followed attempts to identify similarities and differences at the Monetary Policy (MP) level, always in the context of the macroeconomic environment that apply in each case.

We followed a structured method to analyze the subject matter. We tried to model and classify the different MP measures and adapt a "taxonomy" that will help us in our comparative analysis. The same applies to modeling of the crises and the crisis lifecycle, to be able to show the differences at the various stages of the evolution of the crisis.

The key steps followed were:

- Understanding the structure of crises
- Modelling of crises, which will enable comparisons
- Understanding the three Country-wide Crises
- Understanding the three Global Crises
- Analyzing similarities & differences

Literature review

Our economies our undeniably interconnected. A financial crisis is a continuous phenomenon, and it is in the best interest of the monetary authorities to master their responses to the crisis and help their economies survive and accelerate their growth. In this dissertation extensive research has been conducted on several financial crises to evaluate the monetary policy adopted on each one and the effectiveness of it.

The analysis is broken down into two categories: the national financial crises and the global financial crises. In the first category the three cases of Sweden, Mexico and Turkey have been selected due to the extent of the crisis and their interesting monetary policy responses. The Swedish banking crisis during the 1990s according to *Englund (2015)* was the first serious financial crisis that had happened in the industrialized world since the Great Depression in the 1930s. Furthermore, *Englund* argues that the monetary policy strategy adopted by the Swedish government was highly efficient and very proactive, hence the rapid recovery of the economy. Additionally, this view is also shared by *Jonung Lars (2009)* who elaborates further on the characteristics of the successful Swedish monetary policy and its novelty.

Regarding the crisis that hit Mexico in 1994, *Nora Lustig (1995, Brookings Institution)* highlights the devaluation of the peso as one of the main elements causing the crisis, while also noting the spillover effects the Mexican crisis had in other Latin America countries as well. Moreover, *Lustig (1995)* argues that the monetary policies of the Mexican authorities were inefficient in the sense that they were inconsistent with the exchange rate rule. In addition, the author also states that the lack of confidence in the peso was so evident that the IMF endorsement of the economic plan was not able to restore the confidence. *Lustig* concludes by pointing out the importance of the capital inflows and the need for a country to rely mainly on domestic savings, while also taking preventive steps to deter speculative capital flows.

The third nation-wide financial crisis examined is the Turkish one in 2000-2001. According to *Brinke Koen (2013, Rabobank)* the nature of the crisis was bank related. Koen analyses the factors and the architecture of the Turkish banking sector that accelerated eventually the financial crisis. Furthermore, the author examines that the external assistance of the IMF to Turkey and the restructuring of the Turkish banking sector significantly helped the gradual recovery of the Turkish economy. Additionally, *Ozlem Arpac and Graham Bird (2009)* extensively elaborate on the implementation of the IMF program for Turkey, while also noting that the strong financial

support during the Turkish banking crisis of 2001 enhanced the influence of the IMF program and accelerated the recovery of the economy and the banking sector.

The global crises analysis begins with the Great Depression of 1929-1931. *Stephen G. Cecchetti (1992)* dives deep into the causes of the Stock Market Crash of 1929, highlighting the fact that the Federal Reserve could have stopped the Crash. The author also examines the consequences of the crash, with the period of the Great Depression as the main one, while also noting the depth of the contraction. Regarding the monetary policy during the Great Depression, *Price Fishback (2010, Oxford Review of Economic Policy)* analyzed the response of the Fed to the crisis and characterized it as recalcitrant. The author argues that the role of Fed in defending the gold standard was a significant underlying reason of the unorthodox monetary response, since it tied its hand to a great extent. Additionally, the same view is also shared by *David C. Wheelock (1997),* who argues that the Fed was unresponsive to the financial crisis, the bank runs and the contractionary effects of it.

The next milestone financial crisis examined is the Global Financial Crisis of 2008, also known as the Great Recession. *Martin Neil Baily, Robert E. Litan, and Matthew S. Johnson (Brookings, 2008)* deeply examine what led us to the global financial crisis, identifying the asset price bubble combined with financial innovation that hid the risk as one of the main factors. Moreover, the authors elaborate on the importance of the rise in lending to subprime borrowers in driving up a housing price boom, eventually leading to a bust. Additionally, the role of financial innovation in furthering the bubble with the introduction of new financial products (i.e., Mortgage-Backed Securities), while the monetary policy in the US was easing. Regarding the monetary policy responses, according to *Makoto Minegishi and Boris Cournède (2010, OECD Economics Department Working Papers)*, the central banks went beyond their regular measures and adopted unconventional monetary policies to help with the crisis recovery. *Minegishi and Cournède* further analyze the unconventional monetary policy tools and measures and the positive impact these had in the recovery of the global economy. Lastly, *Mattia Guerini, Francesco Lamperti, and Andrea Mazzocchetti (2018)* share the same view about the unconventional character of the monetary policies and describe in their paper the monetary policy followed during the Great Recession ang highlight the importance of the Unconventional Monetary Policies, and more specifically the Quantitative Easing.

The last and more recent global financial crisis is the Covid-19 pandemic crisis with its immense negative impacts on all the economies. The very active response of the ECB is extensively

described by *Benigno et al. (2021, European Parliament),* where it is argued that the monetary policies of the ECB conducted through the monetary and banking channel, as well as the announcements, significantly supported with ample liquidity the already heavily indebted European economies. Moreover, with regards to the response of the ECB, *Pablo Aguilar, Óscar Arce, and Samuel Hurtado (2020, Banco de Espana)* also back up this view, suggesting that the monetary policy measures adopted by the ECB have had a stabilizing effect in the entire Eurozone and helped restore confidence in the financial markets. As for the Fed's monetary support for the pandemic crisis *Eric Milstein and David Wessel (Brookings Institute, 2021)* define as the main pillars of the policy the easing monetary policy through several actions, the support of bank lending and the direct support of businesses and consumers. The authors conclude with highlighting the importance of the injected liquidity to the capital markets in the U.S, fostering this way the recovery of their economy.

2. The mechanics of a financial crisis

Analysis of historical Financial Crises around the world reveals that crises burst because of asset prices increasing at levels that are not supported by factual evidence; a phenomenon referred to as "*Asset Price Bubbles*".

One of the major challenges that Central Banks around the world face is to formulate and implement an appropriate Monetary Policy as a response to the potential financial crisis caused due to these Asset Price Bubbles. To understand fully the optimal monetary policy in a crisis, we must first and foremost be aware of the series of events leading to the crisis. For that purpose, we section the crisis in three stages:

- the initial stage
- the banking crisis stage and
- lastly, the debt deflation stage

Initial Stage: Genesis of a financial crisis

Two key factors that facilitate a credit boom are the innovation of financial products and the elimination of financial restrictions in the market. While these two factors have a positive impact on the economic outlook in the long-run, they tend to have destabilizing effects in the short-run. When new financial products are combined with more liberal financial markets, financial institutions are lured to amplify the number of loans issued, hence leading to a credit boom.
The increasing financial liberalization has a negative impact on the ability of a financial institution to assess the credit risk of a lender, and this in turn leads to excessively risky loans.

The moral hazard problem is introduced in the evolution of the crisis as the lessened frictions in capital markets discourage market discipline, while encouraging banks to engage in riskier investments and lending. When these loans start turning into non-performing and the losses of banks begin to mount, we face a contraction of lending (deleveraging) in the financial system due to the decline in the assets of banks.

Moreover, in the chain of events leading to the financial crisis asset- price bubbles play a crucial role. As we have mentioned we are facing a credit boom in the economy. These asset-price bubbles are induced due to the boom in credit. More specifically, asset-price bubbles are shown

when the price of an asset is over and above its fundamental value. The linkage of the asset-price bubbles and the credit boom comes down to the fact that very often the increased credit in an economy is used to purchase assets, causing them to become "overpriced".

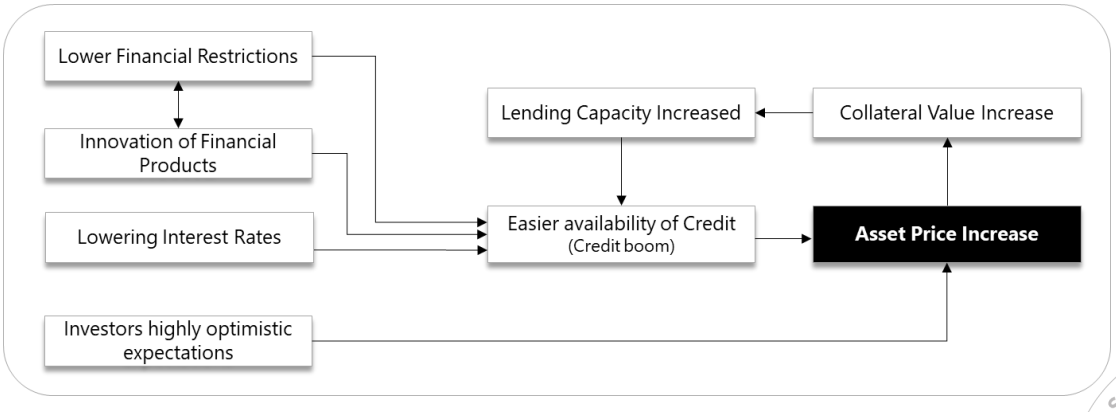
However, at some point the inflation of the prices of these assets stops. The collapse of the asset's price induces the reversal of the mechanism, which ultimately leads to lenders cutting off the credit supply causing in turn the demand and the price of the asset to decline.

As an example, the US Sub-Prime Crisis in the Housing Market in 2007-2009 has been attributed to the preceding credit boom in the economy. The ultimate crash of housing prices caused by the crisis, negatively affected the Balance Sheets of the lending institutions significantly, thereby reducing the credit supply and an ultimate economic downturn whose drastic effect were felt across the economies of the world.

Furthermore, when discussing asset-price bubbles we need to also take into consideration how investors behave; these asset-price bubbles are also caused by the investors' highly optimistic expectations having a severe effect on the prices. Careful analysis by strategists has shown, that the effects of the crisis on the financial system and the economy induced solely due to the irrational exuberance are less grave than the asset-price bubbles due to Credit Boom.

As an example, Dot Com Bubble in late 1990s was caused by speculative investing, abundance of attractive startups and the consequent failure of those startups to generate profits. It was observed in the aftermath of the crisis, that the bursting of The Dot Com Bubble did not have a "very serious" impact on the economy. This was because the recession that was instigated by the crisis was relatively milder.

Figure 1: Drivers of Asset Prices Increase



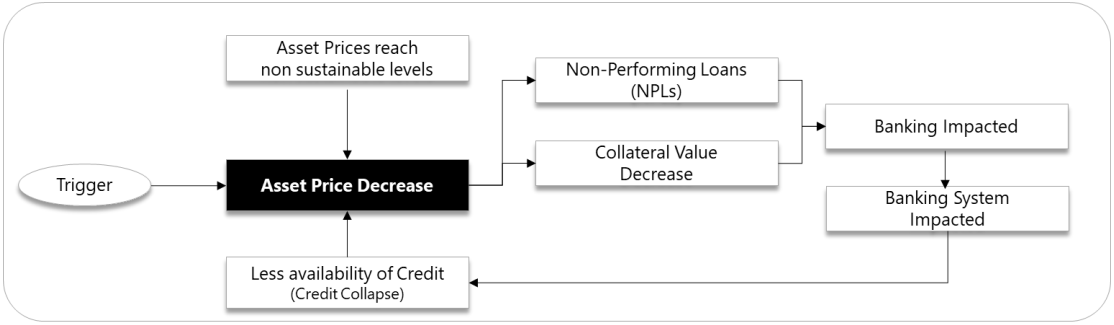
Second and Third Stage: Banking Crisis and Debt Deflation

When dwelling into the dynamics of a financial crisis an important factor is the banking crisis. The consolidated non-performing loans we faced in the initial stage translate into losses for financial institutions, and in various cases bankruptcy.

Bankruptcy in turn means incapability to pay off creditors and other investors. What is an astonishing fact is that these bank crises have an amplifying effect, meaning that it is possible for some banks to become insolvent simultaneously. The underlying reason of this amplifying effect is the problem of asymmetric information; in a banking sector crisis the depositors are unaware about the quality of a bank and hesitant for their deposits, which leads to a major withdrawal of deposits. The asymmetric information issue reappears as it becomes even more difficult for banks to assess how reliable a creditor is, thus leading to even further lending cutting and severe economic contraction.

The final stage of a financial crisis is debt deflation. Till now, at the initial and the second stage, we are facing an immense economic contraction and downturn which has led to the decline of the asset prices. The decline in assets is interconnected with the net worth of a firm and an institution. Because firms and institutions hold in their balance sheets these assets, when a sharp decline in prices hits, the net worth of these assets shrinks. The decline in the net worth makes it more difficult to pay off debt; in terms of balance sheet, the liabilities exceed the assets and indebtedness rises. The debt deflation phenomenon is of high importance in the sequence of events in a financial crisis, deepening even more the downfall of economic activity.

Figure 2: Impact of Asset Price decrease

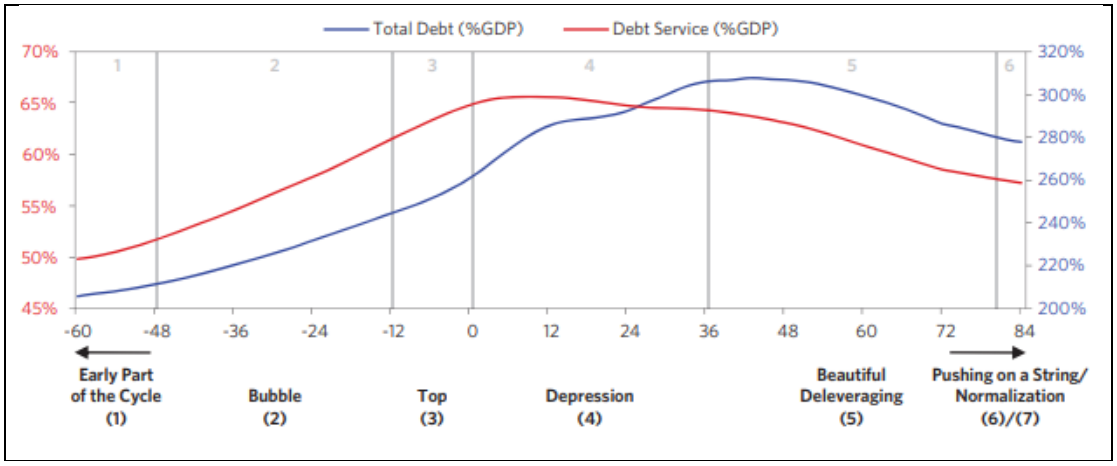


Archetypal Big Debt Cycle

An interesting approach has been proposed by Ray Dalio[1] in his research (2018) after analyzing 48 big debt cycles. These include all the cases that led to real GDP falling by more than 3% in large countries, a condition that is indicated as "*depression*". Dalio claims that all crises undergo an archetypal model of similar patterns, and such a model may help us analyze and 'predict" future crises as they develop.

The chart below illustrates the seven stages of an archetypal long-term debt cycle, by tracking the total debt of the economy as a percentage of the total income of the economy (GDP) and the total amount of debt service payments relative to GDP over a period of 12 years.

Figure 3. Archetypal model (Debt levels and service of Debt curves)



Note: The "0" point in the x-axis indicates the burst of the crisis with the unit of the x-measure being months (+/-)

The following diagrams analyze key attributes/KPIs that describe the behavior of a crisis, namely:

- The Equity Prices
- The Interest Rates
- The Liquidity levels

And their behavior indexed according to the 0 point as shown in Figure 3. It is interesting to see the interconnections of these graphs and their relationship

[1] Ray Dalio (2018): "Principles for Navigating Big Debt Crises"

Figure 4. Archetypal model (Equity Prices-Indexed)

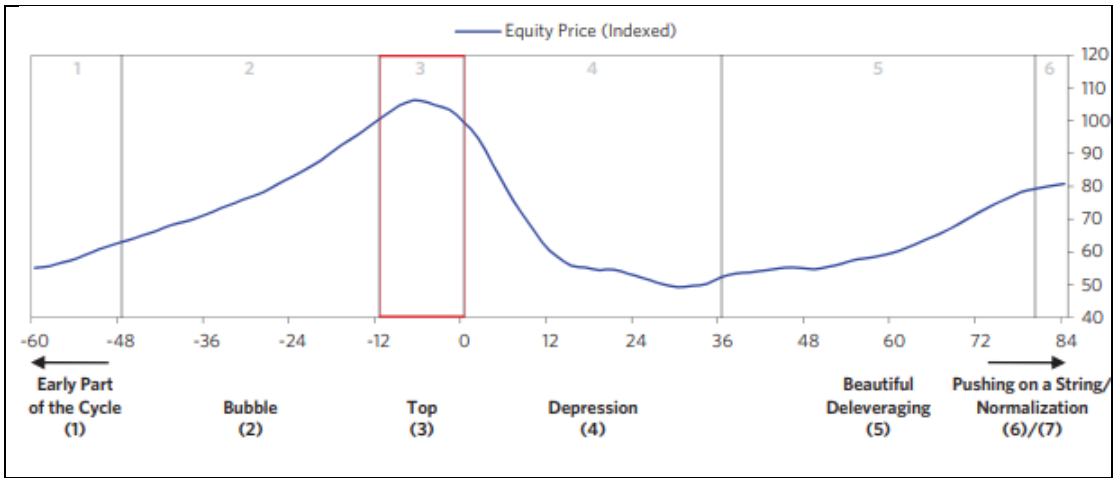


Figure 5. Archetypal model (Nominal Short Interest Rate)

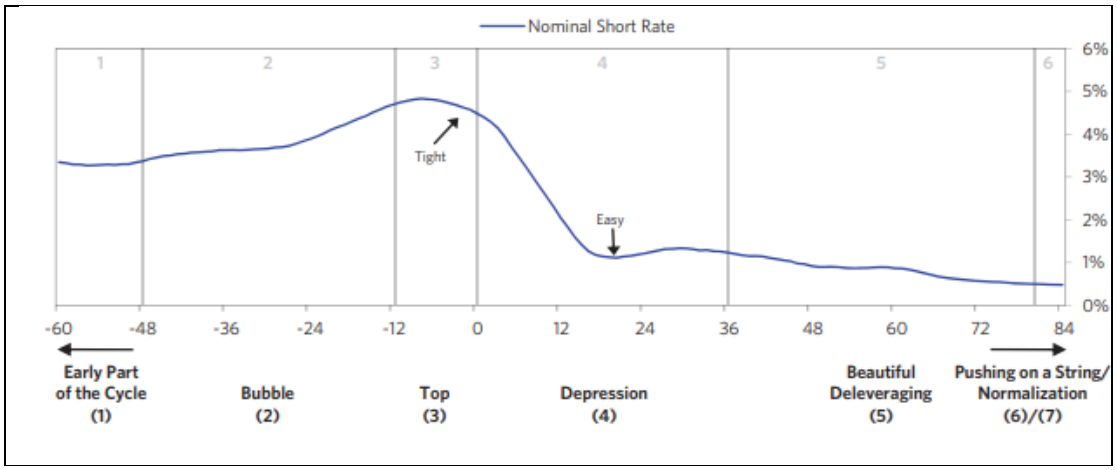
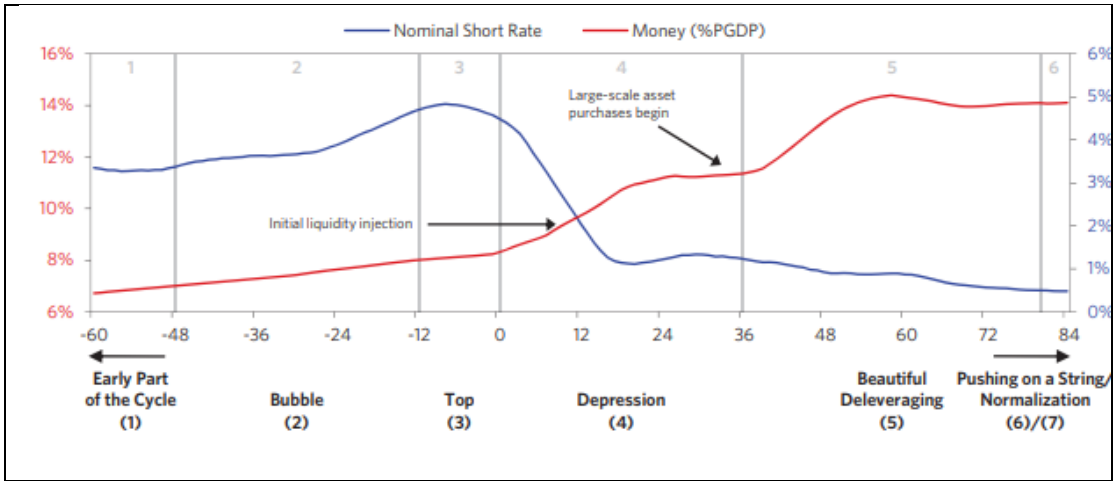


Figure 6. Archetypal model (Liquidity injection)

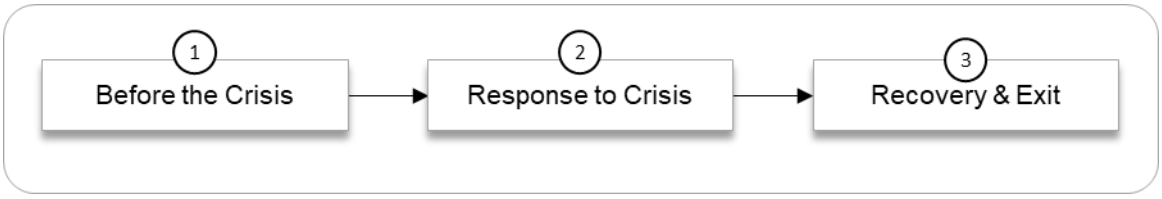


3. Monetary policy taxonomy

In the context of this thesis, we are investigating the Monetary Policy (MP) response to the various crisis stages. Figure 7 indicates a simplified model that will help assess MP measures during:

- Stage 1: Before the Crisis, the period as the crisis accumulates and builds up
- Stage 2: Response to Crisis, burst and the immediate measures to restore stability
- Stage 3: Recovery & Exit, return to normalcy and how the MP measures are 'lifted"

Figure 7. Crisis stages to study Monetary Policies



Central banks have responded vigorously to the challenges posed following the Great Recession (2008). Measures taken are still valid and have been employed also during the COVID-19 crisis.

The traditional monetary policy instruments have been implemented to the extent possible, taking policy rates *to very low levels*. Going beyond conventional instruments, they have expanded the scope of liquidity management beyond traditional counterparties, term length and sources of collateral with the aim of providing ample liquidity to the banking system. Furthermore, some central banks have engaged in open market operations covering a range of assets to stimulate aggregate demand and safeguard financial stability. These unconventional monetary policy measures have, together with traditional interest rate policy and government fiscal and financial market policies, contributed to containing the economic downturn and strengthening confidence in financial markets.

This section discusses the various MP measures employed with the particular emphasis on "unconventional' instruments

Tools of Monetary Policy

Major MP measures taken in response to the crisis can be categorized under five headings:

- lowering policy rates to very low levels
- increasing liquidity provision to financial institutions
- intervening directly in wider segments of the financial market
- purchasing long-term government bonds and other assets
- supporting specific institutions

We can classify and group MP measures in two ways (see figure 8)

- **Conventional Monetary Policies (CMP)**. Based primarily on *Interest Rate Policy*, whereby the central bank influences financial conditions by (a) setting, or closely controlling, a short-term rate (often overnight) and (b) by steering expectations about where it will be set in future ("*interest rate forward guidance")*.

- **Unconventional Monetary Policies (UMP)** Based on a *Balance Sheet Policy*, whereby the central bank influences financial conditions beyond the short-term rate by adjusting its balance sheet (size and/or composition). Typical examples of balance sheet policy include large-scale asset purchases and the supply of central bank funding ("liquidity") at non-standard terms and conditions (e.g., at long maturities, for specific lending purposes). Just as in the case of interest rate policy, the central bank may also wish to steer expectations about future balance sheet adjustments ("*balance sheet forward guidance*").

Figure 8. Central Bank MP options

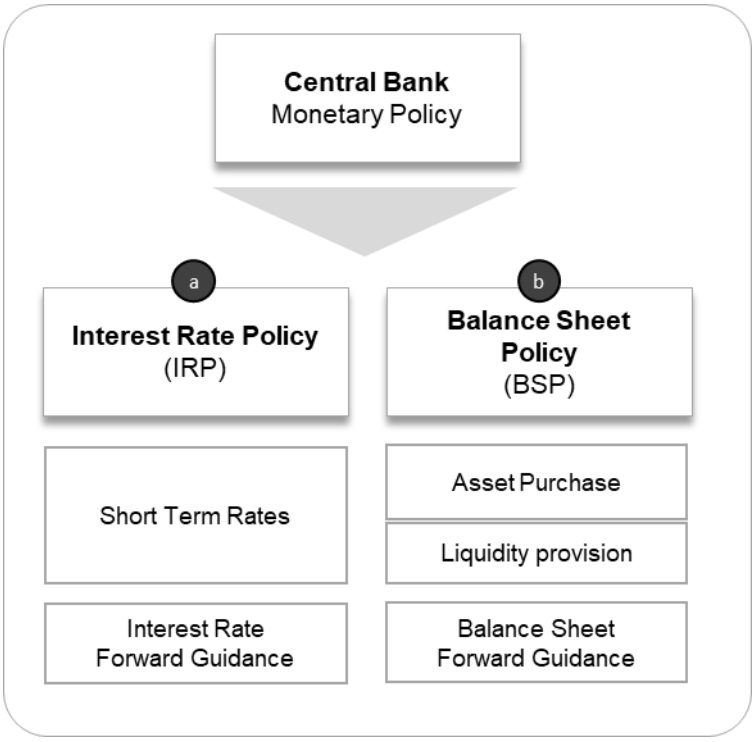


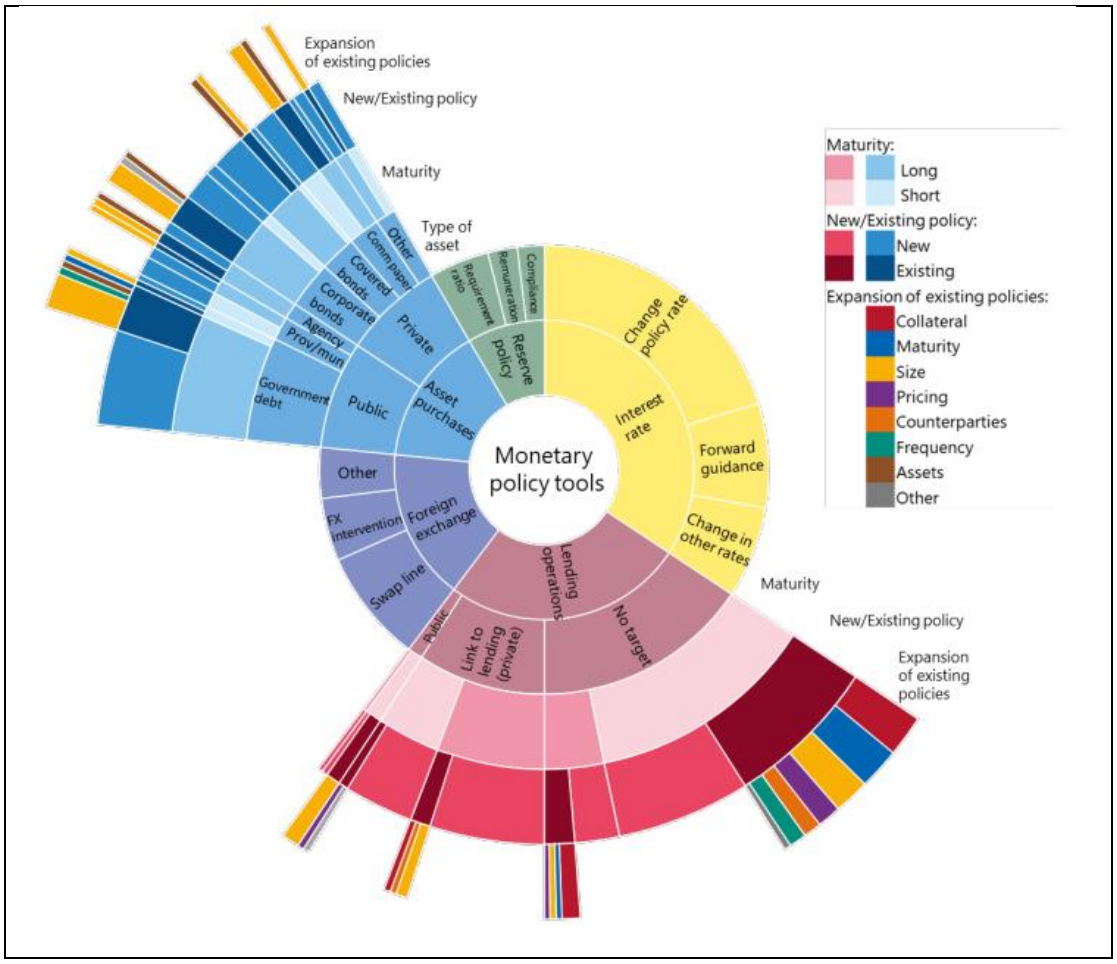
Table 1 MP Classification according to type

A taxonomy of monetary policy implementation measures — Table 1

Policy	Description	Examples
Interest rate policy	Setting the policy rate and influencing expectations about its future path	
Forward guidance on interest rates	Communication about the future policy rate path	The central bank "expects the key [...] interest rates to remain at present or lower levels for an extended period"[2]
Negative interest rates	Setting the policy rate below zero	Negative deposit interest rate at the ECB and at the BOJ[4, 5]
Balance sheet policies	Adjusting the size/composition of the central bank balance sheet and influencing expectations about its future path to influence financial conditions beyond the policy rate	
Exchange rate policy	Interventions in the foreign exchange market	
Quasi-debt management policy	Operations that target the market for public sector debt	Purchases of government debt
Credit policy	Operations that target private debt and securities markets (including banks)	Modifying the discount window facility Adjusting the maturity/collateral/counterparties for central bank operations Commercial paper, ABS and corporate bond funding/purchase
Bank reserves policy	Operations that target bank reserves	The central bank conducts "money market operations so that the monetary base will increase at an annual pace of about 60-70 trillion yen"[1]
Forward guidance on the balance sheet	Communication about the future balance sheet path (composition/size)	"The [BOJ] will purchase JGBs so that their amount outstanding will increase at an annual pace of about 50 trillion yen... as long as it is necessary for maintaining [the 2% price stability] target in a stable manner"[3]

A very useful classification with the various MP policies has been also proposed by BIS on their recent [2]survey of the COVID-19 analysis depicted in the following figure:

Figure 9. BIS MP taxonomy (2021)



In this study the various policies have been classified in accordance with whether they are extensions of existing policies or entirely new ones and a complete database across the world with a respective dashboard is available for further analysis.

[2] Cantu, Cavallino, De Fiore, Yetman (2021): "A global database on Central Banks monetary responses to Covid-19", BIS Working Papers No. 934

The categorization is as follows:

Table 2: BIS Categories of Central Banks actions

Policy	Description
Interest rates	All policy **rate (cut) decisions**, including **forward guidance**, as well as decisions related to other relevant interest rates, if set independently from the main policy rate
Reserve policies	All measures involving central bank reserves such as • changes of the **requirement ratios** • the **compliance framework** or • their **remuneration**
Lending operations	All tools involving central banks' lending to the **private** and **public** sectors. Important parameters are • start and end dates, • the **maturity** of the operation, and • its **size** • **incentives** linked to the counterparty's lending pattern to the non-financial private sector, or if it is designed to lend directly to the public sector
Asset purchases	Central banks' outright **purchases of asset**s, including those conducted with assets of different maturity or risk profiles (i.e., operation twist and swap operations). Important parameters are: • the **size** of the asset purchase program • its **duration**, and • the **type and maturity** of assets involved.
Foreign exchange	Tools which involve **foreign currencies** and/or foreign entities. Important parameters are • the duration of the tool • its size • the maturity of the assets involved

Reactive vs Proactive Monetary Policy Strategies

We can analyze and classify MP measures that various central banks follow, depending on whether the strategy is proactive or reactive i.e., precedes the crisis or acts upon it respectively.

Being proactive (Lean Strategy)

Under this strategy, the Monetary policy implemented by the central bank should timely try to "Pop" or slow the advent of the potentially developing Asset Price Bubble to save the economy from the drastic effects of the financial crisis induced by the ultimate bursting of the bubble. In other words, the Central Bank should be "*leaning against the wind*" of Economic Expansion to hedge risk against potential Financial Crisis.

For Example: The Reserve Bank of Australia, in a response to rising housing prices during the period of 2002-2004, leaned against the bubble by engaging in "open mouth operations" to caution the market participants against the emerging imbalances in the market.

The major opponents of this strategy argue that since our economies are inherently cyclical, thus, these "bubbles" are nearly impossible to detect, that too by the Central Bank's policy makers. They reiterate by saying that these bubbles would be unlikely to develop because the higher paid market participants would already realize that the market value of the underlying assets is higher than its intrinsic value.

It has also been argued, that at any time, a bubble may exist in only a fraction of the myriad of assets available in the market. The monetary instruments used by the central banks are often considered very blunt, thus their effect may fail to address the problem and may further aggravate the situation.

Being reactive (Clean Strategy)

Under this strategy, the Central Bank should not respond directly to the potential Asset Price Bubble. They should only "clean" after the mess created after the Burst of the Asset Price Bubble to stabilize the economy.

Alan Greenspan, strongly argued against leaning against or "popping" potential Asset Price Bubbles. He argued that that raising interest rates would cause the bubble to burst prematurely and more severely thus causing even more damages the economy. He substantiated his view by the historical example of the aftermath of monetary tightening in US in 1929 and in Japan 1989. Thus, in his Greenspace doctrine, he put forth that it was unfair and unrealistic to expect that the usual tools of monetary policy will be effective in the Asset Price bubble's abnormal conditions. He believed that the overall cost of "cleaning up" would be lower than "leaning against" the bubble.

4. Country-wide financial crises

The analysis of the financial crises begins in the national level. In this section the three crises of Sweden, Mexico and lastly Turkey will be reviewed and finally assessed. All the three national financial crises are wisely selected, mainly because of their impact in the economies, the international imprint in some cases and the various monetary policies adopted by the three central banks.

Sweden Crisis (1990-1994)

Context of the crisis

During the early 90s Sweden faced a severe crisis. The Swedish crisis in 1991-1992 was primarily a banking crisis, a byproduct of financial liberalization and a typical credit boom-bust. The Swedish banking crisis poses particular interest in examining it, because of the efficiency of the monetary policy response with no external help.

To deeply understand how the Swedish banking crisis began we must first focus on the financial deregulation of 1985. Before 1985, Swedish banks were under quantitative restrictions as to the amount of loans granted. With the deregulation in 1985 these restrictions were raised, and the lending procedure revived. The role of financial liberalization strongly affected both the banks and the depositors. As the lending restrictions were abolished, commercial and savings banks were competing for market shares by lending even more; more loans meant more market share.

As expected, the high lending volume resulted in a lending boom that provided credit to markets such as the housing one and the stock market. The ample credit in the housing and the stock market was coupled with high inflation and a lax tax system that favored borrowing by offering negative after-tax rates. This multiple combination of conditions laid the seeds for a sharp increase of asset prices. Rising consumption, lower private savings, overemployment, and more imports than exports were the main characteristics of the boom-period. It is essential to note that at the time, the Swedish currency-the krona- was pegged to different currencies

and due to that pegged exchange rate monetary authorities managed to hold back the boom by raising interest rates. However, fiscal policy on the other hand was not properly tight to hold back the boom. The boom became a bust in 1990 due to several causes.

The main reason of the bust was the rise in real interest rise globally, because of the tight German monetary policy that followed Germany reunification. The mechanism that caused the Swedish rates to rise as well was the virtual European Currency Unit (ECU); the krona was pegged to the ECU. Additionally, Swedish monetary authorities and more particular the Swedish central bank, Riksbank, further raised nominal rates to defend the pegged krona during severe speculative attacks. Moreover, a tax reform raised real after-tax rates by lowering marginal taxes and reducing tax deductibility of mortgage rates which in turn resulted in rising private savings rather than further borrowing.

The constantly rising interest rates affected the value of the assets by lowering it, causing an asset-price deflation that severely impacted the financial markets. The prices of houses were much lower than those of the collateral used in the mortgages which in turn affected the banks' balance sheets. Banks were forced to readjust their portfolios causing a decrease in investments and consumption. The crisis further deepened as consumers were trying to sell-off their houses to manage their decreasing wealth, lowering this way the asset prices even more. The stock market was affected as well with deep declines in the stocks of construction and real estate companies. As the construction and real estate sector faced a severe contraction, investment in these sectors declined sharply and unemployment rose. A major driving force of the Swedish economy, the exporting sector, was strongly impacted as well since the krona was overvalued due to the high inflation and wages. The result was declining tax revenues and rising public debt.

The tipping point was in 1992 when the krona faced severe speculative attacks that destabilized even further the financial system of Sweden. It is astonishing that the Riksbank made everything possible to defend its currency against the speculative attacks and raised overnight rates to the unprecedented levels of 500%. The will of the Riksbank to defend its currency and to keep it pegged was remarkable since no other country had ever defended its currency so strongly. The underlying reason of the strong defense of the krona were the five consecutive devaluations during 1975-1982.

Swedish monetary authorities had come to realize that these devaluations did not resolve any problem in the economy rather than concealing it and therefore saw the pegged exchange rate regime and the tight policy it meant as the solution to breaking the devaluation cycle that harmed their economy. They viewed the pegged exchange rate as the nominal anchor for stabilization policies and facilitate towards their goal of lower inflation.

In addition, the Swedish officials were unaware of the impact of the 1985 deregulation on the pegged exchange rate; along with the increased lending, the deregulation favored capital flows that often turned out to be speculative attacks. The Riksbank was forced to stop defending the krona after the many speculative attacks and to let the krona enter a floating rate regime. The floating krona translated in a depreciation, accompanied by rising interest rates, ensured a severe contraction in the Swedish economy that lasted from 1991-1993 which affected the Swedish banks immensely.

Reaction of Central Bank of Sweden

Regarding the monetary policy of the Riksbank to cope with the banking crisis that emerged in 1991 the focus was on saving the Swedish bank from bankruptcy. The main tool of the monetary policy was the blanket guarantee, which essentially ensured that both the depositors and other counterparties of the commercial banks and financial institutions would not materialize any further losses on their claims. The blanket guarantee was a measure widely supported from the entire parliament and the opposition party, facilitating in providing credibility to the policy of Riskbank and the government.

The importance of the blanket guarantee is related to the foreign financing of the Swedish banks. As Swedish banks were heavily reliant on short-term foreign borrowing to finance their activities, a stop in these foreign funds would in turn mean that the Riksbank could no further maintain the pegged krona. The blanket guarantee was a means of supporting the krona and signaling to foreign markets that, besides the speculative attacks, the Swedish banks would continue their financial operations. Moreover, bank runs were prevented because of the blanket guarantee, while simultaneously supporting the entire banking system.

The banking crisis was only the beginning of the financial crisis that emerged in Sweden. Luckily, monetary authorities quickly spotted the upcoming financial crisis and took preventive steps, especially for the banks, that turned out highly sufficient. The swiftness of the monetary policy ensured the maximum certainty of the depositors globally and it was an important element of

the efficiency. The policy focus was on open-ended funding of the banks and for that purpose the *Bank Support Authority, BSA (Bankstödsnämnd)* was created. Furthermore, it is notable the decision that the BSA would have open-ended funding and not a predetermined budget to avoid the refunding in case additional funds to support the banks were needed. The open-ended funding character of the blanket guarantee was another efficient element of the policy, facilitating even further to the credibility of it.

A second characteristic of the monetary policy of the Swedish central bank was the efficient management of the moral hazard issue. The elimination of the moral hazard was achieved through the differentiated resolution policy for the banks. The target was not to save the owners of the banks, but the banks as a whole and thus the owners of the banks were forced to absorb the losses. The result was wide public acceptance of the banking resolution policy since the taxpayers were not harmed. The differentiated character of the banking resolution that ensured the minimal moral hazard was based on the categorization of the banks. The main criteria of this categorization was whether the statutory capital adequacy ratio was intact, and, in the case, it was not, if it was temporary.

The *first category* included the banks that were near the capital adequacy limit but were able to achieve solvency on their own. These banks were directed to find private sector funding to help them and not use public sector funding for as long as they could. The shareholders of the first-category banks were forced to increase capital funding and to facilitate the capital injection of the shareholders, while the Riksbank granted a temporary "capital adequacy" guarantee.

Moreover, the *second category* included the banks that were below the capital adequacy limit but would recover in the end. The second-category banks were banks with short-term problems with estimations for future profits that would help enhance their solvency. They differed from the first category banks in the sense that in many cases private funding was not available for the second-category banks. To ensure resolution of the second-category banks the BSA established more extensive support in the form of loans and capital on top of the guarantee of the first category.

Lastly, the *third category* included banks that were not expected to be profitable at all. In this category the presence of the BSA was even stronger and this was achieved through the liquidation of the problematic bank. Additionally, in the third category the BSA was able to sell off the bad assets of the ailing banks and then merge the rest of it with other banks. More

delicate action was taken to cope with the bad assets of the troubling banks and for this specific purpose two new *Asset Management Corporations emerged*. The main concept was to split the bad and the good assets and transfer the bad ones to the asset management corporation.

Furthermore, the banking resolution policy was backed up also by both proper monetary and fiscal policies in 1992 that facilitated in the recovery of the economy significantly. With the krona being in a floating rate regime after the fall of the pegged rate due to the speculative attacks, a sharp depreciation took place. This depreciation (30%) eventually was long-lasting leading this way in an immense growth of exports. Regarding the monetary policy, the floating krona allowed monetary authorities to focus on inflation by lowering interest rates. As a result, the asset prices stopped falling and the pressure on the banking system was lessened. In terms of fiscal policy, it was expansive since large budget surpluses were accumulated in the year preceding the crisis and deficits during the crisis. In addition, the bank resolution policy was allowed to contribute to the rise in the deficit. The combination of these policies resulted in a rapid recovery of the Swedish economy which in turn facilitated further the bank resolution policy.

Conclusively, the monetary policy of the Swedish authorities during the banking and financial crisis could be surely characterized as a successful one; banks became profitable again and rapid recovery of the economy with a gradually growing exporting sector. Additionally, the monetary policy was efficient since bank runs were entirely prevented during the crisis, a rather hard task to achieve. The astonishing point about the Swedish financial crisis was that the IMF or any other international institutions were not involved, this way further ensuring the trust of public.

The below figure summarizes the Swedish crisis and the graphical representation of the measures taken, depending on the stage of the crisis by following the methodology and the composite measures developed by R. Dalio.

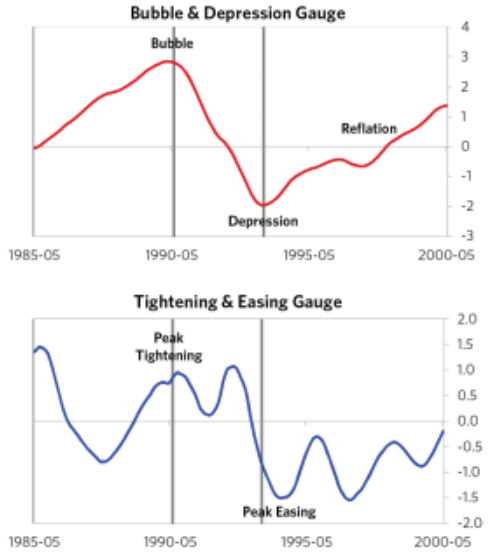
Table 3. Sweden crisis in figures

Crisis build up

- Rising debt, strong growth, and strong housing returns.
- Debts rose to a pre-crisis peak of 239% of GDP. The debt was in Sweden's domestic currency, and the majority was owned domestically, too. Debt service reached 65% of GDP
- Investment low but positive, averaging around 2% of GDP
- Current account deficit of 3% of GDP
- Growth was moderate (2%),
- Policy makers initiated a large tightening
- Taken together, these pressures, combined with tightening money and credit, created an unsustainable situation.

The trigger

- Sweden was vulnerable to a shock which came in the form of housing price declines hitting bank solvency



Depression

- GDP declined (- 6%),
- Stock prices (-34%)
- Home prices (- 7%)
- Unemployment increased by 9%.
- Peak fiscal deficit of 10% of GDP
- Debt as a % GDP went up by 40% as incomes declined and as the government had to borrow

Monetary Policy

- M0 increased by 5% of GDP
- Interest rates were ultimately pushed down to 3%, real FX averaged -5% during the stimulative phase

Mexico Crisis (1994)

Context of the crisis

The Mexican Peso Crisis in the December of 1994 was essentially a devaluation crisis. The main roots of the devaluation of the peso lie in the monetary and fiscal policies that were followed in the same year. The Mexico Crisis is of great importance because it was the source of contagion for a financial crisis, with substantial spillover effects in the Latin America economies. The examination of the Mexican financial crisis is interesting also because of its magnitude.

The main trigger of the devaluation crisis was that several investors believed that the peso was overvalued, combined with the low international reserves that were needed, should a speculative attack on peso take place. The belief of the markets was that this overvalued peso parity was unsustainable in the long-term and the reserves of BoM fell eventually, leaving the government the only option to sustain the parity, to devalue. The first wave of capital outflows began and 5$ billion USD flew out of Mexico. As a response, the Mexican government entered a floating exchange rate regime. The devaluation of peso that took place in the December of 1994 marked the onset of a financial crisis that seriously affected the Latin America economies. After a few days Mexico was very close to default and this resulted in a second wave of capital outflows, but this time not only from Mexico, but also from other Latin America countries as well.

To understand deeply the context of the Mexican Crisis and the financial crisis it triggered we need to dwell into the causes of the peso devaluation. Firstly, Mexico has launched the Pact of Economic Solidarity in 1988, under which the government committed itself in reduction of the fiscal deficit, a more conservative monetary policy, the liberalization of trade and an income policy. The anchor during the time was the nominal exchange rate, helping this way to reduce the inertial inflation and keep the fiscal policy under control. However, anchoring the nominal exchange rate has two profound drawbacks, that were also proved right for Mexico as well.

The first drawback is that the nominal exchange rate anchor eventually translates to a real appreciation of the domestic currency since there is a time gap between the difference of the domestic and the foreign inflation decreases. This translates, in turn, into a real exchange rate appreciation. The exchange rate real appreciation was also supported by the large number of capital inflows in the previous years, due to specific monetary policy that focused on investment attraction. Another factor that contributed to the exchange rate real appreciation is the sharp

fall of the U.S interest rates. The interest rates of U.S and the capital inflows in Mexico are interconnected because investors searched for higher returns. Two additional factors facilitated the large capital inflow to Mexico. Firstly, Mexico proceeded with the privatization of the banks and, secondly, started the negotiations with the U.S for a free trade agreement (trade liberalization). These capital inflows facilitated the exacerbation of the exchange rates since they put pressure in the domestic supply of non-tradeable goods while also reducing the speed of reducing inflation.

Moreover, the current account deficit of Mexico was very high. In the years leading to 1994 private savings fell sharply and private investment rose the same way, leading to a big savings-investments gap. This savings-investments gap was enhanced by the investment boom, as well as the consumption boom that were the byproducts of both credit expansion and inadequate regulatory framework. Furthermore, the reason that private savings declined is mainly the domestic credit expansion for consumption. Two additional factors that decreased private savings were the real exchange rate appreciation and the trade liberalization: consumers were not positive that the trade liberalization was a permanent policy if taking into consideration the low-priced imported goods. Therefore, the consumers shifted their consumption into buying these cheap imported goods as long as they could.

As a result, the real exchange rate appreciation facilitated the current account deficit. The capital inflows were used to finance the current account deficit. However, the same capital inflows resulted in an even further real exchange rate appreciation, worsening even more the current account deficit, affecting both the real exchange rate and the savings-investments gap. The troubling issue of financing the current account deficit with capital inflows, and not with domestic savings, is that if Mexico faced an exogenous shock and capital inflows were affected, then to continue servicing the deficit, sharp and major adjustments were necessary. Moreover, in addition to the savings-investments gap was rising, GDP growth rates were slower than expected, threatening Mexico with a balance of payments crisis.

In terms of monetary policy, one would expect the government either to widen the exchange rate band or depreciate even further to pull back the real exchange rate appreciation. Surprisingly, Mexican authorities did not implement any of these two strategies, mainly because of the belief that the growing current account deficit was temporary. The productivity growth, that would result from structural reforms, would decrease the current account deficit and the large capital inflows would be used to finance the deficit. Another reason the government

decided not to alter the exchange rate was the commitment to pricy stability. A move in the exchange rate policy would undermine this commitment and foreign investors would start withdrawing their funds from Mexico.

Regarding the U.S interest rates at the time, they played a crucial role in the peso crisis. The gradual recovery of the American economy and the fear of inflation because of this recovery were the main two reasons that the U.S government decided to raise the interest rates to slow down economic activity. As mentioned above, the changes in the U.S interest rates can have a significant impact on the capital flows internationally. Countries, such as Mexico, that solely depended on the financing of their current account deficit in the international capital inflows found themselves in serious trouble, as the capital inflows would soon turn into capital outflows. The credit and the investment boom that created stock market bubbles accompanied with the capital outflows of Mexico worsened the situation not only for Mexico, but for the entire financial system.

Reaction of the Central Bank of Mexico

To cope with the situation, the Mexican government decided to use the international reserves it had accumulated from the capital inflows and raise the interest rates to prevent capital outflows. Moreover, it was decided to use extensively the dollar-denominated short-term government instrument-the Tesobono. Tesobonos were essentially short-term public debt instruments redeemable in pesos but denominated in dollars, ensuring this way the investors about the risk of devaluation. Both U.S and Canada stepped in to support this scheme, giving in total 7$ billion USD worth of swaps. The use of Tesobonos increased rapidly and in only one year it has grown from 3.1$ billion USD to 29.2$ billion USD. The reason behind this rapid growth of Tesobonos was that the investors feared that the exchange rate was not sustainable for very long and therefore wanted to hold Mexican debt but denominated in dollars. The astonishing fact about Tesobonos is that they were crucial for the financial crisis that emerged after the devaluation: the huge amount of USD held in Tesobonos (17$ billion) was difficult to payoff the investor, who in turn started fearing a default and subsequently began panic selling.

Moreover, the monetary policy of Mexican authorities aimed at sterilizing the fall of international reserves by increasing domestic credit, resulting in a constant monetary base. This in turn, resulted in the fall of the domestic rates which combined with the expansion of the domestic credit turned into pressure for the peso. As expected, in the view of these events, investors began to withdraw their funds, leading to many capital outflows. As a response, the

government decided to raise the ceiling of the band within which the dollar was allowed to fluctuate to 4 pesos to a dollar. However, the new exchange rate ceiling lacked credibility and only in the next two days Mexico faced 5$ billion USD of capital outflows. The government faced a deadlock: the only means left was to enter a floating exchange rate regime under which the Bank of Mexico could not intervene to maintain the dollar within a specified range. The byproduct was financial distress that affected other countries of Latin America as well.

The financial crisis that followed the peso devaluation crisis was not well predicted. The reason of this false estimate was that no one expected that a Mexican crisis would affect the stability of the financial system. However, the investors that had their funds denominated in pesos were angry about the devaluation policy that was followed and saw it as a breach of contract, resulting in capital withdrawals.

Urgent help was needed to hold back the financial crisis and rescue Mexico from default. The U.S tried to become the lender of last resort for Mexico by proposing a rescue package of loan of 40$ billion USD. However, the package faced difficulties imposed by the Congress and U.S needed to revise their rescue plan. The IMF, BIS were added to the rescue equilibrium, increasing their financial support. The total package of loans amounted 50$ billion USD: 20$ billion (U.S), 10$ billion (BIS), 17.8$ billion (IMF) and 2$ billion (Canada and Latin America). The announcement of the package itself stopped the panic selling but didn't provide long-term confidence, not even after the IMF endorsement of the package. The underlying reason was that the funds of the package were not available immediately and the uncertainty about the political situation in Mexico deepened the problem.

In the following year of the crisis, 1995, Mexico had to reset its policies to gain credibility again. The government aimed at more realistic goals, positive short-term interest rates, sound monetary, fiscal and exchange rate policies and, lastly, efficient monitoring with transparency of the rescue program. The markets responded positively, and the Mexican economy started to rejuvenate.

The below Table summarizes the Mexico crisis and the graphical representation of the measures taken depending on the stage of the crisis following the methodology and the composite measures developed by R. Dalio.

Table 4. Mexico crisis in figures

Crisis build up

- self-reinforcing cycle of unsustainably strong capital inflows, rising debt, strong equity returns, and strong growth.
- Debts rose to a pre-crisis peak of 85% of GDP. A high share of the debt was in foreign currencies (25% of GDP)
- Mexico with a large exposure to a pullback in foreign capital.
- Investment inflows were strong, averaging around 8% of GDP,
- Growth was strong (at 4%),
- Strong asset returns (equities averaged 25% annualized returns over the bubble period) encouraged more borrowing and helped to stimulate growth.

High debt levels left Mexico vulnerable to a shock Mexico's dependence on foreign financing created an unsustainable situation.

The trigger

- balance of payments/currency crisis
- outbreak of political violence

Depression

- Declines in GDP (falling by 10%), and in stock prices (falling by 66%).
- Rising inflation, peaking at 43%
- The central bank spent down its reserves to defend the currency (drawing down reserves by 100%), though by the end policy makers had abandoned their currency defense and the currency had fallen by 37%.

Monetary Policy

- Nationalized banks
- Provided liquidity and
- Purchase of troubled assets.
- Benefited from an IMF assistance program

Turkey Crisis (2000)

Context of the crisis

During 2000-2001 Turkey faced a banking crisis, affecting the entire Turkish economy. It all began, when in the end of 2000 the banks stopped the interbank credit lines to other Turkish banks that were facing health issues. The investors responded to this move by withdrawing their capital and started selling their treasury bills and equities, causing a drop in their value. Furthermore, a private bank, Demirbank, was unable to borrow from the other banks with the interbank rate and was forced to sell some government securities of the portfolio. As a result, the government securities lost even more value. Additionally, banks started selling off their securities because they were left with no other option to meet margin calls requirements. The domino of the securities sell-off is followed by a severe capital outflow from investors.

Moreover, the role of the Turkish central bank (CBRT) was critical in this systemic banking crisis. For CBRT to maintain its domestic assets stable, the emergency credit lines that provided liquidity to banks stop. The byproduct is a severe liquidity crisis in the banking sector. The IMF comes to the rescue and provide Turkey with a package of 10.5$ billion. The package facilitates in restoring some credibility in the market and therefore the CBRT is now able to prevent a further depreciation of the Turkish lira to the US dollar and it does so by mainly using the foreign exchange reserves. However, only in two weeks the reserves are diminished by 25%, leaving Turkey in a serious deadlock. Furthermore, the entire banking sector crisis translates in the beginning of 2001 in a political crisis with focus on the corruption of the banking sector. This political crisis turns out to be very crucial since it eliminates the credibility and the stability about the situation in the Turkish economy that the IMF package provided. The investors saw an opportunity and began speculative attacks against the lira and with CBRT left with minimum reserves to defend its currency, a currency crisis occurs. The CBRT with no excess reserves left decided that the lira will enter a free float regime which resulted in the lira losing 1/3 of its value.

At this point it is necessary to examine the Turkish banking sector in more detail, to better understand the crucial role of it in the implementation of the monetary policies later.

Firstly, the banking system of Turkey was prior to the crisis problematic and fragile since it lacked regulation and supervision. Additionally, banks were the main financing tool of the government because they used to purchase government debt by using their short-term

deposits. Another important fragility was that the Turkish banks relied on funding from foreign investors, leaving them exposed should a capital outflow occur. Lastly, there was a structural maturity mismatch, which emerged from the inability of the private banks to borrow long-term in Turkish lira while at the same time they were lending to the government and other companies long-term.

It is also worth mentioning that the four stated-owned banks owned 30% of the total assets in the banking sector and a vast number of the private banks faced insolvency issues. The role of SDIF was also crucial since during the recession in 1999 prior to the crisis, it took control over 13 banks. However, in the beginning of 2000, 10 out of the 13 private banks owned by the SDIF were accused of fraud and criminal investigations began. This translated in raised concerns about the health of the banking sector and the banks responded by closing the interbank credit lines to problematic banks to reduce their risk. The byproduct of the closed interbank credit lines was the withdrawal of capital from the investors, which as mentioned was one of the triggers of the banking crisis that emerged. The losses accumulated by the Turkish banking sector during the banking crisis were extreme. The interbank rates were continuously rising and after the devaluation of the lira private banks recorded losses as well, with NPLs reaching 19% in 2001. As a result, the SDIF had to come to the rescue and take control over 18 banks totally. The situation in the banking and financial sector was worsening and immediate action was more than necessary.

Reaction of Central Bank of Turkey

In terms of the monetary policy implemented to cope with the crisis that erupted, it mainly focused on the elimination of inflation. More specifically, an exchange rate stabilization program was announced by the CBRT and the government, aiming at 10% inflation in one year. The exchange rate stabilization program was also significantly facilitated by the IMF with a Stand-By Agreement of 4$ billion (the main lending instrument of the IMF to advanced and emerging economies that need financing). The main pillar of the SBA was a pre-announced crawling peg exchange rate regime, which is essentially a band of rates that a fixed-rate exchange rate currency is allowed to fluctuate. Under the fixed band regime, the currency must remain within the band, and this is achieved by either buying or selling the currency. The result of the crawling peg policy is the control of currency moves and therefore better monitoring of the currency in times of devaluation.

Furthermore, the Turkish government requested from the IMF that the SBA would provide more international reserves, so they could finance the balance of payments, and to engage in the program both public and private investors internationally. Another pillar of the SBA was the privatization of large state-owned companies while also further regulatory actions towards the banking and financial sector. The result of the implementation of the SBA was a slight decline of the inflation and an increase in capital inflows, due to the eased interest rates. However, the program was not as efficient as hoped since the main target for the inflation was not reached within the time frame and the banking crisis began. A highly possible reason of the inefficiency of the program could be that the SBA focused exclusively on the macroeconomic imbalances and completely ignored the serious problems of the Turkish banking sector.

The need for the restructuring of the financial sector was apparent. During May 2001 a restructuring program of the banking sector was introduced by the Banking Regulation and Supervision Agency (BRSA). The main elements of the program were the state banks restructuring, resolution of the SDIF banks, strengthening of the private banks and an enhanced regulatory and supervisory framework. The first goal of restructuring the state banks was achieved by strengthening their capital structure using 22$ billion provided by the SDIF.

Additionally, the state banks were merged and privatized and SDIF banks were liquidated and merged as well. A complementary amount of 28$ billion to help with the strengthening of the capital structure of the banks was provided by the SDIF. The total funds provided by SDIF were financed by the government with debt issuing. The downside of this government financing was that public debt reached unprecedented high levels as well. Moreover, regarding the regulatory framework for the banking sector, it was reintroduced with various changes in banking laws, that followed EU practices. The first regulatory change was that instead of 8% capital adequacy ratios, banks were now required to have 12%, facilitating this way the elimination of financial risks. Secondly, the foreign exchange mismatch of banks was eliminated since lending in foreign currencies was now only allowed to those that had revenue in foreign currency as well. Lastly, in terms of regulatory rules, repos were included in balance sheets and derivative products were considered now credit, resulting in the minimized counterparty risk.

Conclusively, the Turkish banking crisis triggered a currency crisis and the country's economy faced severe contraction and inflation. Drastic measures were implemented from the government to reestablish normalcy in the financial and banking sector with highly efficient outcomes. Moreover, the role of the IMF was crucial since it assisted Turkey with 30$ billion in

total under the form of the Stand-By Agreement, helping the establishment of confidence in the financial markets as well. Eventually, the turmoil stopped and the exchange rate that suffered severely from the currency crisis was no longer under the crawling peg regime, helping the entire Turkish economy to recover gradually.

The below Table summarizes the Turkish crisis and the graphical representation of the measures taken depending on the stage of the crisis following the methodology and the composite measures developed by R. Dalio.

Table 5. Turkey crisis in figures

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Crisis build up

- Rising debt, strong equity returns, and strong growth.
- Debts rose to a pre-crisis peak of 60% of GDP. Debt was in foreign currencies (46% of GDP i.e. a large exposure to a pullback in foreign capital.
- Investment inflows were 3% of GDP.
- Aided by that rising debt and capital, growth was moderate (at 2%)
- Strong asset returns (equities averaged 22% annualized returns over the bubble period) encouraged more borrowing and helped to stimulate growth.

Taken together, these bubble pressures and Turkey's dependence on foreign financing created an unsustainable situation

The trigger

- a balance of payments/currency crisis
- political turmoil and violence.

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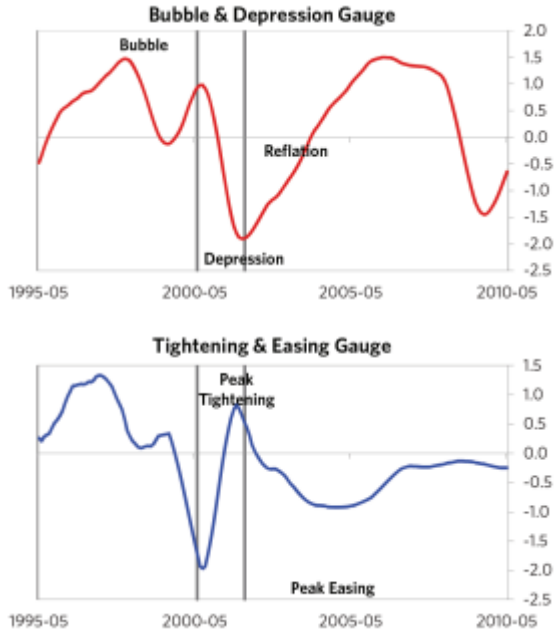

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Depression

- Policy makers hiked short rates by 157%
- Decline in the currency (real FX fell by 12%) which coincided with self-reinforcing declines in GDP (falling by 10%),
- Stock prices (falling by 78%).
- High and rising inflation, peaking at 62%

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Monetary Policy

- Nationalized banks
- Provided liquidity and
- directly purchased troubled assets.
- Benefited from an IMF assistance program and enacted structural reforms designed to increase labor market

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5. Global Crises

Following the analysis of the several crises, the next important stop are the Global financial crises. Every single person has somehow felt their magnitude in the economies since they all significantly affected our everyday lives. In this section the three global financial crises are examined with chronological order; from the Great Depression of 1929 to the Great Recession of 2008 and in the recent Pandemic crisis.

The Great Depression (1929)

Context of the crisis

The Great Depression could be named as the heaviest economic contraction that lasted from 1929 to 1930. In the aftermath of the Stock Market Crash of 1929, that shocked every investor at the time, the economic downturn rapidly began its route. The following years consumer spending and investment dropped, causing steep declines in industrial output and employment as failing companies laid off workers. In 1933, the economic contraction of the economy reached its peak and unemployment rates skyrocketed with 15 million Americans unemployed and multiple bank bankruptcies.

To further our understanding around the premises of the Great Depression, an extensive investigation of the causes of it will give better insights to evaluate the monetary policy measures that were undertaken after. The first strong argument is linked with the nature of the US economy during the 1920s, where rapid expansion of the economy's output occurred. When combining the increased wealth in an economy with the speculation features of many stock investors, it is natural for the stock market to face a similar expansion. However, as we have mentioned about the stages of a financial crisis, the stock prices were overpriced since the production started facing a decline. Moreover, the economy at the time could be described by low wages, high consumer debt and loans that were illiquid. Altogether, these factors facilitated a recession of the American economy.

Throughout the 1920s, the U.S. economy expanded rapidly, and the nation's total wealth more than doubled between 1920 and 1929, a period dubbed "the Roaring Twenties." The stock market, centered at the New York Stock Exchange on Wall Street in New York City, was the scene of reckless speculation. As a result, the stock market underwent rapid expansion, reaching its peak in August 1929.

By then, production had already declined, and unemployment had risen, leaving stock prices much higher than their actual value. Additionally, wages at that time were low, consumer debt was proliferating, the agricultural sector of the economy was struggling due to drought and falling food prices and banks had an excess of large loans that could not be liquidated. The bubble finally popped causing the stock market crash and the gold standard acted as a mediator for the financial crisis to spread around the globe.

A counteractive argument about the causes of the stock market crash of 1929 states there were two factors responsible: the Fed's behavior and the public statements of government officials. It is a fact that the monetary policy at the time till 1929 was restrictive, with Benjamin Strong in charge of the Fed of New York. Shortly after he passed away in 1928, the next president of New York's Fed, Adolph Miller, advocated that the share prices were in high levels causing negative effects on the economy, and sought out with his policies to bring stock prices at lower levels. To do so, Miller ensured to discourage banks to lend to investors that would use the borrowed money to purchase shares. In turn, the interest rate on broker loans started to rise as well.

Furthermore, regarding the various statements of government officials that the stock prices were at very high levels, one could argue that speculation was the underlying reason. The statements supported Miller's proposal and facilitated in lowering the stock prices. The Fed was not willing to provide the necessary liquidity to banks that would use this money to extend broker loans. The main reason that Miller's presidency did not support facilitating the banks to extend the broker loans was the belief that it was credit unavailable to the commercial sector and, hence they raised the rates leading to a dysfunctional economic activity.

After the stock market crash in 1929 the Great Depression followed; a 4-year period described by extremely low production, deflation and reduced economic activity as well. Moreover, a set of regulatory constrictions was introduced that monitored the intervention of the government in the securities market. With regards to the length of the recession, *Bernanke (1983)* states that

the role of financial intermediators was crucial. Many credible borrowers were denied loans due to the increased cost of intermediation and essentially the economy faced a steep decline of aggregate supply. In addition, the transmission of the financial crisis in the U.S could be solely justified by the gold standard. As we have mentioned, the Great Depression was a period with high deflation in the U.S and the gold standard resulted in the deflation of the current account deficits of the industrialized countries, amplifying the negative effects of the recession globally.

Reaction of central banks

Moving forward with the response of Fed in the outbreak of the Great Depression recession, it has been claimed that the responsiveness was not optimal. The years leading to the market crash of 1929 were described by high discount rates and open-market sales that were intended to eliminate speculation in the stock market. However, during the Depression (1929-1933) the monetary policy of the Fed was described by two key features: borrowed reserves (discount window) and market interest rates as the chosen monetary policy measures. The discount window loan mechanism means that the less the member banks borrow from the Fed, the more flexible the money conditions are and vice versa. In the beginning of the Great Depression both borrowed reserves and market interest rates showed a sharp decline, false signaling that the money conditions were "easy".

Furthermore, it is notable that no further open-market purchases were conducted during 1929-1931, but the Fed made sure to significantly raise the discount rate. A milestone in the conduction of the monetary policy was the gold standard crisis in 1931, where several European countries abandoned the gold standard, eventually resulting in massive capital outflows from the United States and in a respective decline in the commercial banks reserves. The Fed responded in these outflows with a raise in the discount rate. However, no open-market purchases were made to replace the outflow of the commercial bank reserves. Moreover, the Fed's monetary policy was described by many as unresponsive during the time because of the lack of open-market purchases in government securities and the underlying reason was the lack of Fed's reserves itself. The first expansionary policy move is the open-market purchase of 1.1 billion USD in 1932. Another action of the Fed during the Great Depression was the liquidation of the loans and the reduction of wage rates to return to a sounder basis. The prevailing reasoning behind the lack of responsiveness of the Fed is the dedication of policy makers in the

gold standard and the attachment to the preservation of it resulted in a rigid monetary policy during the Great Depression.

The below Table summarizes the crisis using the Great Depression and the graphical representation of the measures taken depending on the stage of the crisis following the methodology and the composite measures developed by R. Dalio.

Table 6. The Great Depression (1929)

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Crisis build up

- Between 1926 and 1929, the United States experienced a bubble that was driven by a self-reinforcing cycle of rising debt, strong equity returns, and strong growth.
- Debt had reached a pre-crisis peak of 125% of GDP (in the US domestic currency, and the majority was owned domestically)
- Growth was strong (at 3%)
- Strong asset returns (equities averaged 31% annualized returns)

The trigger

- 1929 stock market crash
- Eventually the dynamic turned, producing a self-reinforcing bust and an "ugly deleveraging,"

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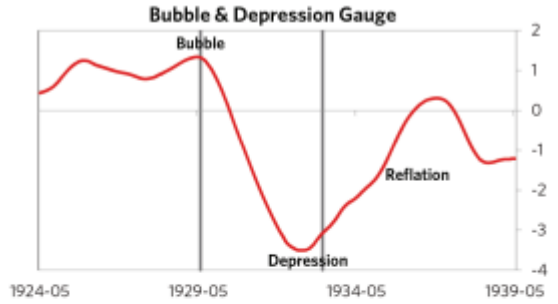

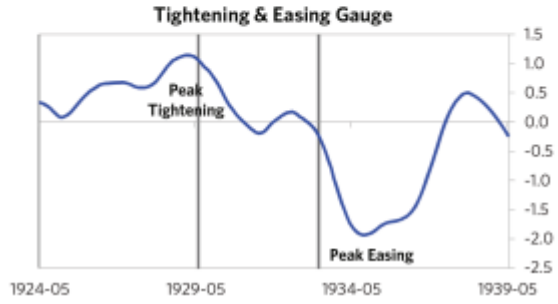

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Depression

- GDP (falling by 26%)
- Stock prices (falling by 84%)
- Home prices (falling by 24%)
- Unemployment rates increased by 23%

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Monetary Policy

- Government broke the peg to gold,
- M0 increased by 6% of GDP
- Interest rates were ultimately pushed down to 0%
- real FX averaged -5%
- Aggressive in managing its financial institutions and bad debts, pulling 8 out of 9 classic policy levers. In particular,
  - provided liquidity and
  - directly purchased troubled assets

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The Great Recession 2008

Context of the crisis

The global financial crisis of 2008 could be named as one of the biggest shocks and economic downturns so far. By picturing the historical context of the financial crisis that in no-time affected globally every economy, one can understand deeper the various monetary policy measures used by the central banks to cope with it.

As we have mentioned regarding the stages of a financial crisis, the 2008 crisis started with a credit boom as well. During the time, the Dot-Com bubble emerged and the Fed, to boost the economy in the aftermath of the 11/09 attack, lowered significantly the interest rate. As a result, with ample cheap market in the market, the house prices began to increase as even more consumers used the low mortgage interest rates to purchase houses. The lack of credit control and the financial liberalization helped even for non-credible consumers to obtain a loan. The introduction of new financial products, such as asset-backed securities, and more specifically mortgage-backed securities made it feasible for the banks to mount these loans and sell them to another institution. The volume of transactions of mortgage-backed securities was so high that eventually an entire secondary market emerged, where essentially subprime loans traded. Additionally, lax capital requirements ensured a riskier investing environment for both banks and creditors.

Eventually the housing bubble reached its final peak and the interest rate started to rise as well, leading to the housing bubble boom with house prices taking the downhill. The mortgages began to turn into subprime one after the other and the mortgage-backed securities, in turn, started to lose their value. After the credit boom and bust, the banking crisis started to show up when the interbank market faced limitations due to extreme uncertainty and lack of trust among the banks that had already amounted losses in their balance sheet due to the subprime mortgage-backed securities. The peak of the banking crisis was with great certainty the collapse of Lehman Brothers, going down in history as the largest bankruptcy in the U.S. The amplifying effect of the banking crisis began, and very soon the banking crisis domino turned into bankruptcies. The global economy faced an extremely severe contraction and immediate action was more than necessary by monetary authorities.

Reaction of central banks

For contemporaneous monetary economists, the Great Recession will be remembered as the period when the common wisdom of monetary policy faced its greatest limitations. Indeed, during the liquidity trap phase that followed the great recession, interest rate adjustment policies proved to be completely ineffective. To react, major central banks – including the Federal Reserve (Fed) and the European Central Bank (ECB) – have been compelled in designing new monetary policy instruments and in experimenting new monetary policy transmission channels. As a result, we distinguish between two classes of monetary policies:

- Conventional Monetary Policies (CMP) based on interest rates policies
- Unconventional Monetary Policies (UMP) based on balance sheet policies

Regarding the monetary policy followed to cope with the immense downturn of the Great Recession we examine both the response of Fed and of ECB.

To begin with, in the aftermath of the financial crisis in 2007 Fed at first responded in a conventional way, by lower refinancing interest rates. Although this interest rate policy worked for the first period, at some point the interest rate reached the zero-lower bound and this in turn made the interest rate policy no longer useful. However, Fed came up with an immediate response using Unconventional Monetary Policies (UMP). More specifically, the Fed started an Asset Purchase Agreement program that included four tiers, through which the Fed acquired obligations and mortgage-backed securities (2008-2010). Moving forward, the UMP policies continue with the APA program increasing its volume and start purchasing also other types of long-term Treasury securities. At the end of the crisis and the end of the APA, the Fed bought mortgage-backed securities and treasury bonds monthly (85 billion USD per month). Conclusively, besides the lowering of the refinancing interest rates the Fed has spent over 900 billion USD and this in turn facilitated the upturn of the economy.

Regarding the response of the ECB, we face some similarities. Firstly, ECB adopted some Unconventional Monetary Policies as well. The Quantitative Easing (QE) was essentially an asset-purchase program that targeted in buying each month a volume of 60 billion Euro. The range of assets varied between sovereign bonds and asset-backed securities, as well as corporate securities. However, the startling fact that although both the Fed and ECB used very similar UMP, but didn't had the exact same positive effect has an underlying reason. When the financial crisis stroke, EU countries already had very high debt-to-GDP ratios, while in the US the ratio

was not so high. The high debt-to-GDP ratio combined with contracting fiscal policies did not facilitate to the maximum the positive impact of the UMP used by the ECB during the crisis. However, the QE program used by ECB has helped to cope with the economic downturn of the Eurozone sovereign-debt crisis, while also remaining an ongoing program.

In order to fully examine the exact measures, both conventional and unconventional used by the major central banks at the time, a deeper analysis is necessary. The categorization of the measures used by the central banks can be broken down into five pillars-measures: low policy rates, increased liquidity, direct market intervention, asset- purchasing programs and direct financial support of certain institutions.

To begin with, the most widely used policy across all the central banks was the lowering of the policy rates. The lowering of the rates was so sharp, that in some cases it hit the zero lower bound. However, the central banks always tried to keep the rates slightly above zero, to prevent the depositors from withdrawing their money. This policy could be characterized as a strong one since the monetary authorities made use of the creation of expectations about low policy rates for longer than expected. Furthermore, the next policy in the categorization was the increased liquidity one. At the time it was of extreme importance due to a peculiar disfunction of the financial markets, a mismatch of the interest rates. On one hand the low policy rates of the central banks facilitated the lending among the commercial banks. However, due to extreme uncertainty conditions in the financial markets and of market participants, the counterparty risk rose as well, leading to higher money market interest rates. The response of the central banks was to ease even further the lending conditions, to facilitate the initial low-rate policy that faced difficulties, with several new measures.

Firstly, the limit imposed by the central banks regarding the liquidity available in the markets relaxed. With the increasing demand for liquidity during the distress period, this measure facilitated crucially to smooth out the transactions. Another newly introduced measure regarding the increased liquidity policy was the relaxation of the eligibility of the collaterals required. More specifically for a commercial bank to obtain a loan the use of collaterals, in case of bankruptcy, is necessary. When relaxing the criteria about the collaterals accepted, the central banks essentially facilitate even further lending and, thus, liquidity in the financial markets. Moreover, under the increased liquidity umbrella scheme, central banks also included in their funding lists several institutions that could not borrow from other banks, helping them with solvency issues as well. Another important measure undertaken was the expansion of the

duration the liquidity provision; for ECB and the Fed this translates to expanding the liquidity provision for up to 1 year and 3 months respectively. Lastly, to increase liquidity in the markets the central banks began to engage in currency swaps among banks to deal with the shortage of dollars.

In addition to these newly introduced monetary policy measures the central banks also reacted by directly intervening in the financial markets, and not only in money markets, to hedge against the crisis. The most direct policy among all the central banks used was asset purchase programs (APP), also known as Quantitative Easing (QE). The main scope of APP interventions was to increase the liquidity in the markets and increase the asset's prices as well. The range of the assets included varied: mortgage-backed securities, commercial paper, corporate bonds, covered debt, equity, foreign exchange, agency bonds, securitized products and, lastly, long-term government bonds. More specifically with regards to the exact assets included in each asset purchase program and the volume of each program it is astonishing that the most active by far central bank was the Fed. The Direct Purchase Program of the Fed included purchasing mainly long-term government bonds, mortgage-backed securities, and agency bonds. Respectively, the Direct Purchase Program of ECB included only covered bonds. Fed, moreover, intervened directly to the markets by also launching the Term Asset-Backed Securities Loan Facility that included purchases of securitized products.

Regarding the volume of each APP and, especially, the purchase of long-term government bonds the cases of Fed, BoJ and BoE are examined. The Fed made outright long-term government bonds purchases that totaled 300 billion USD, which translates to 2.1% of the GDP of USA at the time. Another interesting case of quantitative easing was that of BoE: the amount of purchased long-term government bonds with regards to the GDP of England tripled, starting from 5.4% of GDP, in the beginning of the crisis, and finally reaching 14.3% of GDP.

The results of such interventions and the increased liquidity in the financial markets are mirrored in the monetary base of the central banks. It is remarkable that although all the central banks engaged in policies and measures aiming at boosting liquidity in the markets, differences in the monetary bases are spotted. For all the large central banks an increase in the monetary base was spotted, but the differentiation occurs in the reason of the increase of the monetary base, due to the different measures adopted by each bank. For instance, the asset purchase programs were mainly responsible for the increase in the monetary base of the Fed and of BoE, while for

the ECB and BoJ the increase in the monetary base occurred mostly due to the liquidity support to the banking sector.

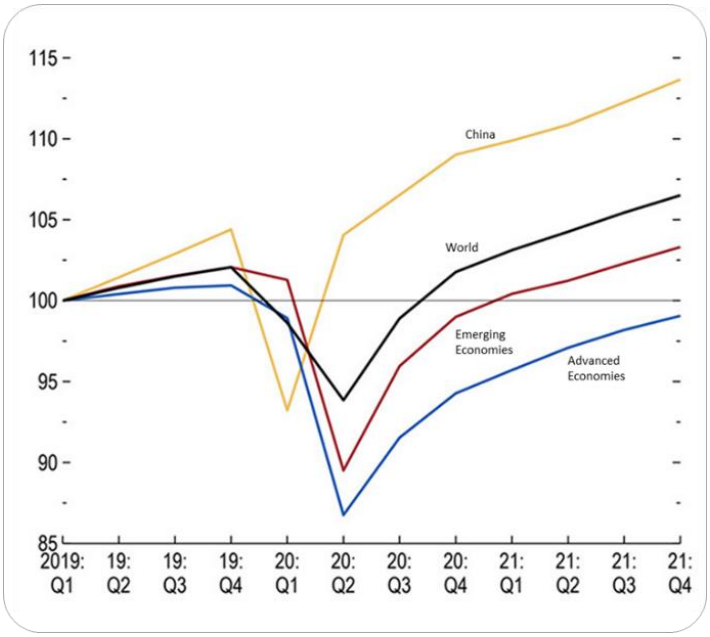
The COVID-19 Pandemic Crisis

Context of the crisis

It was early in 2020 when the unprecedented health shock of the Covid-19 pandemic and its unparalleled economic repercussions have been felt worldwide, impacting most countries, and simultaneously affecting *demand, supply, and financial conditions*. The pandemic has been a common, massive shock across the global economy.

During spring 2020, lockdowns imposed to limit the spread of the virus led to a generalized sudden stop, severely compressing productive activities. Containment and social distancing measures contributed to a *sharp reduction of demand* for many goods and services. The abrupt *contraction in household income and firms' cash flow* increased the risk of delinquency on mortgages and loans to consumers and businesses, raising concerns about the health of the financial system; equity markets came under stress. The impact on the world and regional GDP has been profound as shown in Fig.10

Fig 10. Quarterly GDP in select regions, source IMF



The economic imprint of the pandemic crisis has been felt worldwide. The pandemic crisis in economic terms is two-sided: both supply and demand sides were affected severely. Regarding the transmission mechanisms in economy, one can identify three. The first transmission mechanism is consumption related. As national lockdowns and social distancing measures were imposed, consumer confidence was reduced and thus, directly affecting consumption. Furthermore, the second mechanism that facilitated the transmission of the economic crisis is through the financial markets. The immense shock that severely affected financial markets and institutions led to a fall in household wealth, which in turn had a twofold effect: the savings rose, and consumption decreased further. Lastly, the supply side shock is connected strongly with the supply-chain: as the consumption decreased, and therefore the production as well, the demand for labor fell sharply and unemployment reached extremely high records. It is also notable, that as the income of households decreased, the demand for imported goods decreased as well, leading in turn to lower exports for all the countries worldwide.

Reaction of central banks

Central banks mission was crucial for managing the crisis. Did they react equally, swiftly, and forcefully in different economies? Which measures were deployed most extensively? Did the response entail the adoption of new tools or merely the extension of existing ones?
Overall, we can categorize the actions that central banks took depending on the type of economies:

- **Advanced Economies.** Central Banks set a twofold goal (a) early during the pandemic, monetary policy measures aimed at stabilizing financial markets and preventing the pandemic from turning into a renewed financial crisis. Purchases of public assets and liquidity provision under favorable conditions were the main instruments of this type of intervention (b) when the liquidity situation of the household and corporate sectors started to deteriorate, central banks' goal became one of cushioning the contraction in real activity by ensuring the provision of credit to the private sector under attractive conditions, despite rising credit risk.

- **Emerging Economies**. Different strategies were followed depending on the characteristics of the country. Overall, most emerging countries were at a relatively low point of the business cycle, with aggregate demand generally below potential. Central bank's monetary policy actions were mostly towards supporting aggregate demand

and in some cases complementing with interest rate reductions and asset purchase program.

Table 7a. COVID-19 Monetary tools Advanced Economies

		Advanced Economies										
Tool type	Measures	US	EA	JP	GB	CA	AU	CH	DK	NO	NZ	SE
Interest	Policy rate cut	✓			✓	✓	✓			✓	✓	✓
Lending operations	Liquidity provision	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
	Targeted lending	✓	✓	✓	✓		✓	✓			✓	✓
Asset purchases[1]	Government bonds	✓	✓	✓	✓	✓	✓				✓	✓
	Commercial paper	✓	✓	✓	✓	✓						✓
	Corporate bonds	✓	✓	✓	✓	✓						✓
	Other private		✓	✓		✓						✓
Foreign exchange	USD swap line		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Swaps[2]											
	Spot intervention							✓				
Reserve policy	Remuneration						✓	✓			✓	
	Requirement ratio	✓										
	Compliance											

Table 7b. COVID-19 Monetary tools Emerging Asia, LATAM, Eastern Europe

		Emerging Asia										Latin America						Eastern Europe			
Tool type	Measures	CN	HK	ID	IN	KR	MY	PH	SG	TH	VN	AR	BR	CL	CO	MX	PE	CZ	HU	PL	RO
Interest	Policy rate cut	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lending operations	Liquidity provision	✓	✓	✓	✓	✓		✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Targeted lending	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	
Asset purchases[1]	Government bonds			✓	✓	✓		✓		✓					✓	✓			✓	✓	✓
	Commercial paper					✓															
	Corporate bonds					✓				✓									✓		
	Other private													✓	✓				✓		
Foreign exchange	USD swap line					✓			✓				✓			✓					
	Swaps[2]			✓	✓				✓				✓	✓	✓	✓	✓		✓		
	Spot intervention		✓	✓										✓				✓			
Reserve policy	Remuneration	✓		✓																	
	Requirement ratio	✓	✓	✓	✓		✓	✓				✓	✓		✓	✓	✓			✓	
	Compliance						✓	✓				✓	✓						✓		

The further analyze the monetary policy measures adopted by the governments worldwide, the cases of the Fed and ECB will be examined in more detail.

To begin with, the United States faced a severe contraction of economic activity as expected. To support the U.S economy, the Fed initiated several monetary policies. The first group of policies adopted by the Fed falls to the umbrella of "Easing Monetary Policy". More specifically, the Fed's main tool for policy-making – the federal funds rate- was widely used. The Fed

proceeded with a cut in the federal fund rate (the rate that banks borrow overnight from each other), touching almost 0% levels. The reason why this policy measure is of great importance is that the federal fund rate is used as a benchmark for other short-term and long-term rates as well. As a result of this sharp cut, the spending was increased since the cost of borrowing was very low.

Furthermore, the second monetary easing tool used was the one of further guidance. The Fed made announcements about the future path of the interest rates and committed to retaining the rates close to zero. The further guidance tool is useful, since it aims at keeping the expectations about the rates contained and at avoiding the lack of confidence in the financial system. The third and last easing monetary policy tool was Quantitative Easing (QE), where the Fed began purchasing immense amounts of debt securities. In the beginning of the Covid-19 economic crisis the focus of Fed's QE was on the mortgage-backed securities market, due to its significance in the credit flow and its role in the previous financial crisis. Progressively, the focus of the QE in the U.S shifted to support the economy overall. The Fed spent 700$ billion in Treasury securities and mortgage-backed securities guaranteed by the government. In the first months of the crisis the Fed declared that the security- purchasing program would continue until money markets were smooth again and proceeded with at least 120$ billion purchases for a single month. In the end of 2020, Fed began to slow down the QE purchases, totaling in 15$ billion per month.

Additional to the Easing Monetary Policy group of policies, several steps to support financial markets were taken. Firstly, actions were made to boost security firm's lending through the Primary Dealer Credit Facility (PDCF). In the PDCF essentially Fed offered low interest rates loans to 24 large primary dealers (trading counterparties of the New York Fed in its implementation of monetary policy). The main goal of this facility was to support the primary dealers during stress times in credit markets, to ensure smooth operations. The second action towards the support of the financial markets was the Money Market Mutual Fund Liquidity Facility (MMFLF) under which the Fed was lending to banks that provided collateral such as Treasury securities and commercial paper that were purchased from primary money market funds. The reason behind the initiation of this facility was to stop money market funds outflows. When the pandemic crisis started, the investors were unsure about the quality of the securities held by the primary money market funds, leading to simultaneous withdrawals. The MMFLF facilitated in backstopping these money market mutual funds outflows.

In addition to the PDCF and the MMFLF facilities, the tool of the Repo Operations and the initiation of the Standing Repo Facility (SRF) was widely used by the Fed. To elaborate further, a repurchase agreement (repo) is a short-term secured loan: one party sells securities to another and agrees to repurchase those securities later at a higher price. The Fed broadened its repos agreements to increase the cash in the money markets. The underlying importance of the repos market in the conduction of the monetary policy is interconnected with the federal funds rate, since any disfunction of the repos market will severely disrupt the federal funds rate. During the pandemic crisis the Fed exceeded in total 120$ billion in the repo operations, that way significantly supporting money market smooth functioning. An additional repo facility named Foreign and International Monetary Authorities Repo Facility (FIMA) was also introduced, essentially ensuring that foreign central banks had access to dollar funding without the need to sell Treasury Securities in the market and disrupt the money market functioning.

The last step towards supporting financial markets is the international swap lines. By using swaps on an international level, Fed provided U.S dollars to foreign central banks and in return it charged interest rates on the swaps. The international swap lines are a powerful tool for improving liquidity of U.S dollars globally while also supporting other big central banks to tackle with the issue of their dollar funding.

The third component of the Fed's monetary policy during the COVID-19 crisis is the support to banks to continue their lending operations. The loan mechanism is crucial to ensure the optimal operation of the financial system, channeling the funds to efficient investments. The support of bank lending is directly addressed with the discount window- the lending to depository institutions. The collateral accepted varies and so the Fed has a small risk when making these loans. During the first months of the pandemic the Fed significantly lowered the rate charged in the discount window by 2%, reaching 0.25%. As a result, banks continued to operate normally without facing issues with money withdrawals. However, the downside of the use of the discount window for banks is the signal it sends to the market about the health of the institution: when a bank resorts to the discount window for lending it may signal to the markets that it is facing financial liquidity issues. To tackle with the signaling issue, an agreement amongst the 8 biggest central banks was made to all borrow from the discount window. Moreover, an additional policy measure to support the banking systems was the relaxation of the regulatory requirements. The Fed allowed banks to not meet their regulatory capital and liquidity buffers as well as the reserve requirements ratio, to continue more easily their lending operations.

Following the monetary policy actions undertaken by the Fed, it was also of great importance to support businesses. Fed proceeded with direct lending to *major corporate employees*, through the *Primary Market Corporate Credit Facility (PMCCF),* which enabled Fed to purchase bonds and make loans directly to the corporations involved. In addition to PMCCF, another facility named *Secondary Market Corporate Credit Facility (SMCCF)* enabled Fed to expand the nature of assets purchased, that now included corporate bonds and exchange-traded assets. Main area of focus of these two facilities was to ensure access of the companies in credit to continue their operations without facing any further difficulties. The total amount purchased via these facilities reached 850$ billion dollars, giving that way a great credit injection in the economy. Lastly, the Fed initiated the Commercial Paper Funding Facility (CPFF), a facility designed for Fed to purchase commercial paper, thus directly lending to corporations. It is worth mentioning that Fed supported SMEs as well, through three newly introduced facilities: *New Loans Facility, Expanded Loans Facility, and Priority Loans Facility,* lending in total over 600$ billion.

The last equally important pillar of Fed's pandemic monetary policy was the support of households and consumers. The already existing *Term Asset-Backed Securities Loan Facility (TALF)* aimed at helping consumers and small businesses. To achieve that the Fed through the TALF essentially made loans to holders of asset-backed securities and accepted as collateral new loans.

To assess the monetary policy strategy that Fed adopted during the pandemic crisis, it is important to keep in mind that capital markets in the U.S are the main channel of credit, if compared to other countries. This is the reason that U.S monetary authorities put so much attention to providing ample liquidity in the capital markets through the several facilities. The banking system was provided with a safety net as well, which allowed banks to continue lending, acting as a form of hedge to economic contraction due to the pandemic.

Regarding the monetary policy measures undertaken by the ECB, one must note that the member-states already had very high debt to GDP ratio. Since the beginning of the pandemic, on March 2020, ECB started an expansionary monetary policy strategy to support all member-states. The analysis of ECB's response to the pandemic crisis is based on three pillars: the monetary channel, the banking channel, and public announcements.

To begin with, the first component of the "monetary channel" policy refers to the already existing *Asset Purchase Program (APP)*. More specifically, ECB aimed at strengthening the APP and ensured monthly securities purchases of 20 billion Euro and an additional 120 billion Euro till the end of 2020. The second component of the "monetary channel" policy is a newly launched program: the *Pandemic Emergency Purchase Program (PEPP).* The PEPP was explicitly designed to cope with the negative impact of the pandemic in the economies and aimed at the ease of the constraints on national public spending. The amount invested in the PEPP totaled 750 billion Euros only for 2020. After a few months of the PEPP operation two crucial rounds of changes were applied. The first round of changes concluded that the total amount invested in the program would increase: an increase of 600 billion Euros was decided, making the total sum of the funds 1.35 trillion Euros. Secondly, the time horizon of the program was altered: the extension till the end of June 2021. An additional decision the Governing Council of the ECB took was the reinvestment of the principal payments of the securities purchased by the PEPP till the end of 2022.

At the end of 2020 the second round of changes at PEPP was implemented. An additional increase of the PEPP funds of 500 billion Euros and a further extension of the time horizon till the end of March 2022. The total amount of the PEPP portfolio accumulated at 1.85 trillion Euros since the beginning of it. Finally, the reinvestment period of the principal payments of the securities was extended as well till the end of 2023.

Moreover, the tool of the *forward guidance* was utilized to support the monetary policy strategy. The ECB made a commitment to continue the expansionary monetary policy. As a result, the fiscal constraints of each member-state had to comply with due to their participation in the National and Resilience Plans (NRRPs) laxed-the NRRPs are the plans of the EU for the member states that need to abide with, to access the funds of the Recovery and Resilience Facility (RRF).

Regarding the last channel of monetary policy used by the ECB-the banking channel-it is of equal importance. The first open market operation was the temporary LTRO (long-term refinancing operations), which essentially are 3-month liquidity-providing operations in Euro and therefore provide long-term refinancing to the financial sector. Furthermore, an additional program was introduced: the PELTRO (Pandemic Emergency longer-term refinancing operations. ECB decided to conduct seven series of PELTROs to ensure enough liquidity in the eurozone financial system during the pandemic. More specifically, PELTROs are fixed-rate

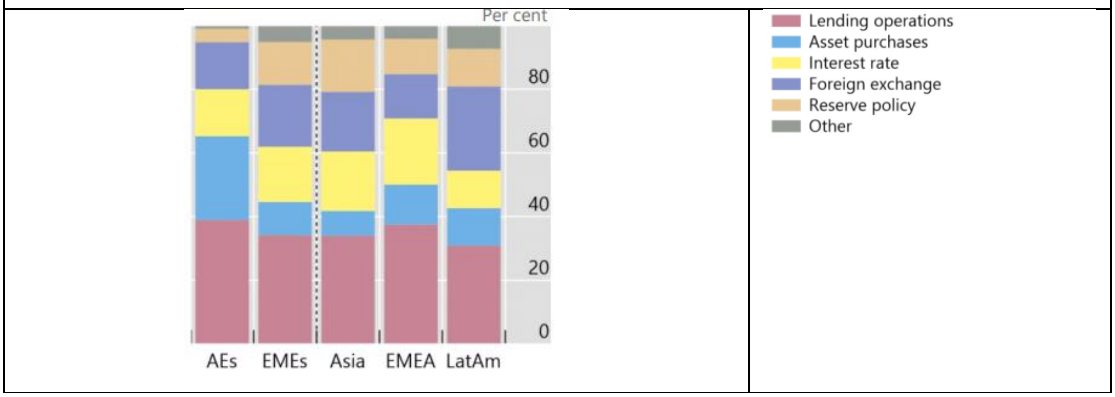
liquidity supplies and usually each program had an interest rate of approximately 0% and in some case the program's interest rates reached even negative levels (-0.25%).

Continuing the "banking channel" monetary policies of ECB, the Targeted longer-term refinancing operations were utilized (TLTROs). TLTROs are essentially open market operations of the ECB that provide financing to credit institutions for a maximum period of 4 years. The main goal of these targeted operations is to provide low-rate funding to banks so they can, in turn, continue their lending operations with ease. It is worth mentioning that the third TLTRO program was strengthened, and the collateral requirements were eased, improving this way majorly the refinancing conditions for banks in distress. Additional to the seven TLTROs programs, three new were launched for the second half of 2021, with the relaxed collateral conditions and extremely low interest rates continuing as well. Lastly, a supportive factor was the public announcements of ECB about the course of the monetary policy being followed that facilitated the conduction of the expansionary strategy.

Conclusively, the ECB's expansionary monetary policy was effective since it tackled with the negative impact of the covid-19 pandemic. Both the liquidity offered by the monetary channel and the banking channel, significantly supported member-states to continue their implementation of the national expansionary fiscal policies and banks to continue their lending operations that supported a huge number of firms financially.

The following dashboard[3] summarizes the findings

Table 8b. Share of policies by region



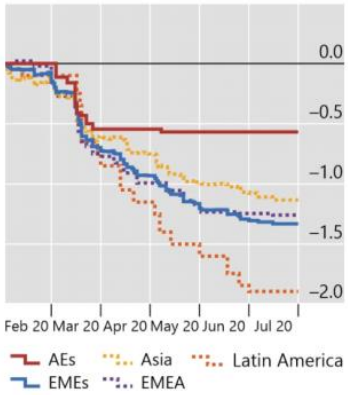
And more in detail below:

[3] Cantu, Cavallino, De Fiore, Yetman (2021): "A global database on Central Banks monetary responses to Covid-19", BIS Working Papers No. 934

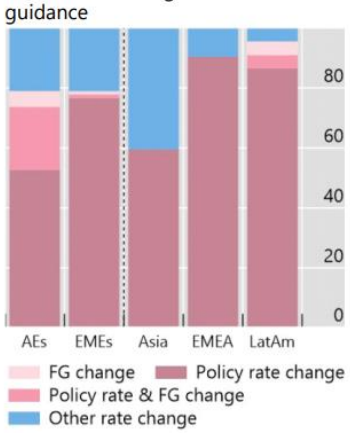
Table 8b. Comparison of measures across economies

Interest Rate Policy

Cumulative policy rate changes[1]

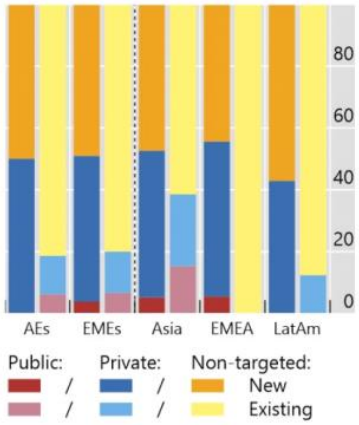


Interest rate changes and forward guidance

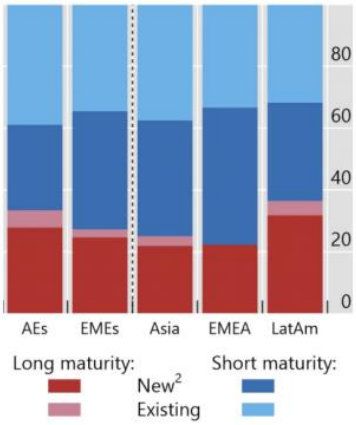


Lending Operations

Targeted to private or public sector

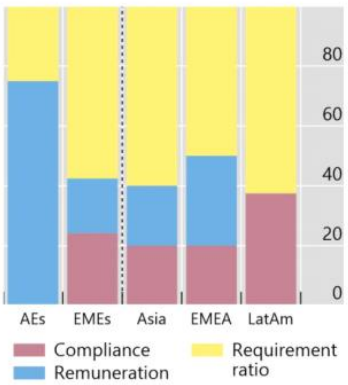


Maturity[1]



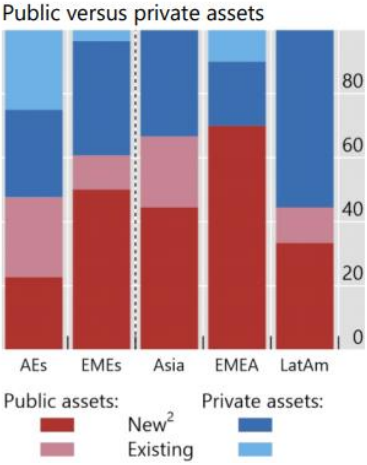
Reserve Policy

Reserve policy



Asset Purchase

Public versus private assets



6. Comparative Analysis

The thorough examination of the three country-wide crises and the three global financial crises is essential for the comparative analysis. In this section, the crises of Sweden, Mexico, and Turkey as well as the Great Recession, the global financial crisis of 2008 and the Covid-19 crisis will be compared. Our comparative analysis will be based on two metrics: the monetary policy tools used in each crisis and the effectiveness of the monetary policy followed.

Country-Wide Crises comparison

All the three country-level crises had a severe impact on the economies of Sweden, Mexico, and Turkey, and in some cases (Mexico) the negative effects were spilled over other economies as well. They were induced mainly by fragility of the banking system of the countries and of high debt, accompanied by credit boom and busts. Although they all had in common the severe economic contraction, they significantly differed in the monetary policy followed to overcome the crisis, and hence in the effectiveness of it.

The crisis of Mexico in 1994 was essentially a devaluation crisis where external investors strongly believed that the peso was overvalued, and the international reserves were running out. Indeed, the peso was overvalued, and the international reserves were inefficient, so the government of Mexico proceeded with the devaluation of the parity. Afterwards, Mexico faced major capital outflows and entered a floating rate regime. The notable fact about the Mexican crisis are the spillover effects it had in the Latin America economies, threatening this way the entire financial system. Regarding the monetary policy of Mexico, the main tools were the international reserves to defend the peso and the interest rates that were raised to prevent capital outflows. Debt issuing, in the form of the Tesobono, was extensively used as well to prevent further the devaluation. The debt issuing tool could be characterized as the first difference of the monetary policy tools used in contrast to the monetary policy tools used in Sweden and in Turkey.

External help, from U.S.A and Canada, was crucial since they facilitated with 7$ billion in swaps. However, in terms of efficiency of the monetary policy, it was rather inefficient. The choice of the Tesobonos as a monetary policy tool backfired since the immense amount that was held in Tesobonos was extremely difficult to payoff and hence the investors began panic selling with the fear of default in mind. The case of Mexico differs from the ones of Sweden and Turkey in

terms of external lending volume. More specifically, Mexico was supported by the IMF, BIS, U.S, Canada, and Latin America with a total amount of financial support surmounting 50$ billion, whereas in the case of Turkey the IMF contributed with 30$ billion and in Sweden there was no presence of external help at all.

The astonishing fact about the external intervention (i.e.: IMF) in the Mexico crisis was that although the volume of support was the largest when compared to the one of Turkey, it did not turn out as efficient as one would expect. The underlying reason for this lack of efficiency of the external support of Mexico was that the funds would not be available immediately and hence the package did not provide long-term confidence in the Mexican economy.

Regarding the Turkish crisis in 2000 and the Swedish in 1990, they both had at their core the banking sector. Although these two crises were both essentially banking crises that translated afterwards in depreciation crises as well, they have more differences rather than similarities. To begin with, the main difference of the monetary policy is that Turkey reached out for external help from the IMF, whereas Sweden decided not to ask for external funding. The IMF supported Turkey with a total package of 30$ billion (Stand-By Agreement), that was characterized with success since it managed to reestablish confidence in the Turkish economy. In terms of the domestic monetary policy followed, both Sweden and Turkey proceeded with actions towards the banking sector. More specifically, Turkey restructured the financial sector in 2001 by restructuring the state banks, strengthening the private banks, and introducing a much needed regulatory and supervisory framework.

However, the most novel approach was the one of the Swedish central bank. Sweden faced a severe banking and devaluation crisis, as Turkey did. The Swedish government was very swift in its response to the crisis and solely focused on saving the banks from bankruptcy. The "blanket guarantee" was the monetary policy used that ensured the continuation of the foreign financing of the Swedish banks and the prevention of bank runs. The Swedish resolution approach could be characterized by preventiveness, since they foresaw the financial crisis emerging after the banking crisis and took immediate actions to save the banks. For that purpose, it was decided that the banks were provided open-ending funding by the Bank Support Authority. The novelty of the Swedish monetary policy lies in the categorization of the banks and the funds each category was eligible. As a result, the monetary policy tool of open-ending funding was customized to the needs of each bank and therefore efficient usage of the funds was achieved.

Lastly, the tool of the interest rates was used as well and the Swedish government decided to lower them to manage inflation, resulting in turn in less pressure on the banking system and thus rapid recovery of the economy. As mentioned, Sweden was the only out of the three that had zero international involvement, and besides that fact, it surprisingly managed to support its economy. Furthermore, although both Mexico and Turkey accepted international help in the form of large funds, they faced difficulties exiting the crisis and supporting the banking sector and the economy.

Global Crises Comparison

The three global crises examined all had in common the extremely widespread negative repercussions in the interconnected economies. Each crisis- the Stock Market Crash in 1929, the Global Financial crisis in 2008 and, since this day, the Pandemic crisis- was utterly unexpected and, in each case, different monetary approaches were necessary. Throughout the years and after each global crisis both monetary authorities and economists became very creative and suggested in many cases, and in a great extent, very unconventional monetary policies that had a profound positive impact on the recovery of the economy. The optimal approach to understand the similarities and differences in the monetary policies implemented in each crisis is the comparison between the crisis of 1929 with the ones in 2008 and 2020. Subsequently, and due to the few years, that separate the last two global crises, we will examine and compare the monetary policies and their efficiency in the global financial crisis of 2008 and the pandemic crisis.

To begin with the comparative analysis of the Great Depression (1929) with the Great Recession (2008) and the Covid-19 Pandemic crisis (2020), it is notable that the historical context of the first one with the other two is significantly different; financial liberalization is not so widespread and monetary authorities are focused on the gold-standard rule. The monetary policy adopted in the aftermath of the stock market crash in 1929 was widely characterized as inefficient. The main tools used were the discount window (borrowed reserves) and market interest rates. The first dissimilarity with the monetary policy approach of the Great Depression and the other two crises is that no open-market purchases were conducted during the three years of the recession, while in the last two global crises open-market purchases were one of the main monetary policy tools. The rigidity of the monetary policy during 1929-1931 was imposed by the dedication of the policy makers in the preservation of the gold standard, which not only facilitated the recovery but fired the gold standard crisis in 1931 with several countries abandoning it, resulting

in massive capital outflows. The inefficiency of the monetary policy during that time is backed also by the fact that the first open-market purchase was conducted late and was comparatively small in volume; only 1.1$ billion in 1932- years after of using only conventional monetary policy tools. The Great Depression crisis was unanimously not handled optimally, but it laid however the seeds and experience for better monetary policy approaches in future global crises.

Continuing our comparative analysis of the global crises, it is of great interest to examine the similarities and differences between the monetary policies used in the global financial crisis of 2008 and of the pandemic crisis of 2020. Both crises were an immense shock to the economies worldwide. The Great Recession in 2008 was a long-lasting one and one could say that it prepared the ground for deeper economic downturns due to the pandemic crisis, mainly because of the very high debt-to-GDP ratios.

The monetary authorities proved to be significantly more prepared and eager to save the economies than in the case of the Great Depression. It is notable that the monetary policy tools adopted in both crises seem to have more similarities rather than differences. Firstly, in both cases the monetary authorities used Conventional Monetary Policies (CMP) as well as Unconventional Monetary Policies (UMP). More specifically, the first policy move of the Central Banks in the two crises was the use of the conventional monetary policy tool, the interest rates. In the crisis of 2008, the central banks made interest rates adjustments by lowering them, however proving to be inefficient because they had already reached the zero-lower bound. Similarly, in the Covid-19 crisis the monetary authorities reacted also in a conventional way by cutting the federal funds rate significantly, resulting in an increased spending due to the lower borrowing cost.

Furthermore, the use of Unconventional Monetary Policies in the two crises has both similarities and differences. The main unconventional monetary policy tool was the Asset Purchase Programs (APP). The APP was firstly introduced to cope with the financial distress in the global financial crisis of 2008 and was also widely used in the pandemic crisis as well. The first dissimilarity regarding the APP program is related to the volume of the program in each crisis. For instance, the APP launched by the Fed for the 2008 crisis was in total 900$ billion, while for the pandemic crisis the APP of the Fed the initial volume was 700$ billion while progressively increasing. Moreover, the APP of the ECB (the QE) in the 2008 crisis was significant in amount (60 billion Euros monthly) but less efficient than expected due to the already very high debt-to-GDP ratios of the member-states. Notably, during the pandemic crisis ECB reinforced the

already existing QE, while also introducing a new and explicitly designed program for the need of the pandemic, the PEPP that totaled 1.35 trillion Euros.

Additionally, an important difference between the monetary policies adopted in the last two global crises is the more direct intervention and support to the overall economy of the central banks in the pandemic crisis. While in the Great Recession central banks directly supported certain financial institutions, in the Pandemic crisis more delicate support was shown. To elaborate further, the Fed supported financial markets with the PDCF facility (boosting security firms lending), the MMFLF (stopped money market mutual funds outflows) and Repo Operations. Moreover, the Fed during the pandemic crisis directly supported businesses (PMCCF, SMCCF), SMEs and consumers through several actions and facilities, an action not taken in the global financial crisis of 2008.

Lastly, during the pandemic crisis both the Fed and ECB proved comparatively more supportive to the banks than in the 2008 crisis. More specifically, the Fed supported the banking channel by lowering the discount window rate and by relaxing the eligibility criteria, an action also taken in the 2008 crisis. The ECB during the pandemic facilitated bank lending with several Open Market Operations that included LTROs, TLTROs and a new OMO for the needs of the pandemic; the PELTRO.

With regards to the efficiency of each monetary policy approach in each crisis, one could argue that both were efficient. The Unconventional Monetary Policy tools adopted in each situation provided the required liquidity and support to the financial markets globally, while facilitating in the economic upturn.

Conclusively, the comparative analysis of the two last global crises is of great interest. In both cases the monetary policy tools of low policy rates, increased liquidity, direct market intervention, APPs and direct financial support were activated and in certain cases to a different extent. The experience of the global financial crisis and the severe economic impact it had, better prepared the monetary authorities to act more inclusively and directly to the support of their economies. When the case of the Great Depression of 1929 is added on the equation it is obvious that the handling of the crisis recovery in the Great Recession and the Pandemic was significantly efficient. The comparative analysis proved that to overcome the immense economic repercussions imposed by unexpected shocks, unexpected monetary policy measures need to be adopted to initiate the recovery of the economy.

7. Concluding remarks

It seems that crises are endogenous to economies and that they repeat themselves in cycles. The all have common characteristics although there are differences and similarities among them.

Central Banks are constantly increasing the portfolio of solutions, engaging more and more unconventional measures and policies. The world becomes wiser and more ready to react to the crises with more tools available. The international experience has shown that through trial and error, every crisis can be overcome.

Through our analysis of the six crises one thing is apparent; central banks and government understand and learn from their policy mistakes. The mixture of monetary policies is described by a plethora of tools and strategies; from more conventional monetary policy tools such as the interest rates, to unconventional ones such as the Asset-Purchase programs and in many cases international external funding.

The concluding remark of this study is that maybe we should rethink how we see the crises -*that will certainly follow*- and view them as an opportunity to show the importance and novelty of monetary policies to help in an even better, faster, and equal recovery of our global economy at last.

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